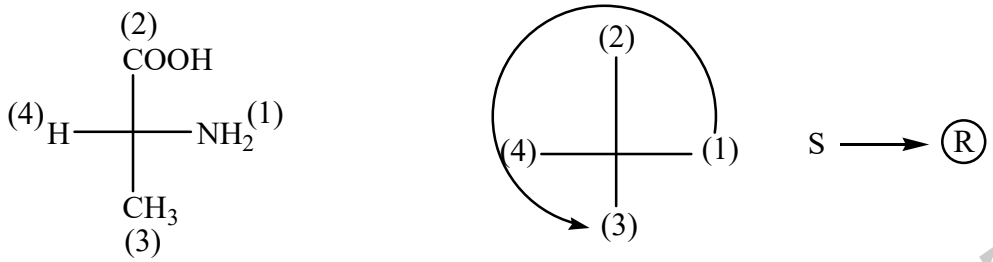
STEREOCHEMISTRY (PREVIOUS YEAR)

HINTS & SOLUTION

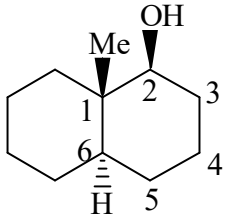
1. Gives priorities to groups attached to chiral centre atom accroding to CIP rule.

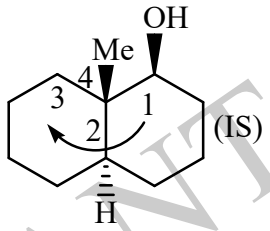


Lowest priority group (4) on horizontal line. Rotation of group is taken reverse.

Correct option is (b)

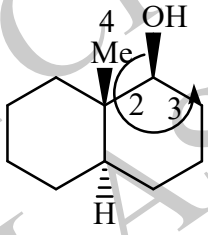
2.





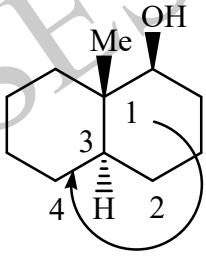
(IS)

lowest priority group towards the observer configuration arise opposite to the rotation
∴ (S) configuration



(2S)

first priority group towards the observer
∴ (S) configuraion



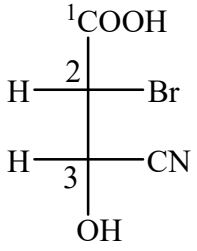
(6R)

lowest priority group away from the observer.
∴ (R) configuration

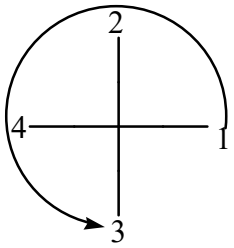
Correct option is (a)

3. Priority according to higher atomic number

QUANTA CHEMISTRY CLASSES

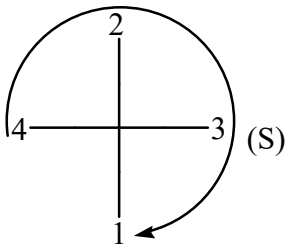


At carbon centre number (2)



(R) due to lowest priority group present on horizontal line

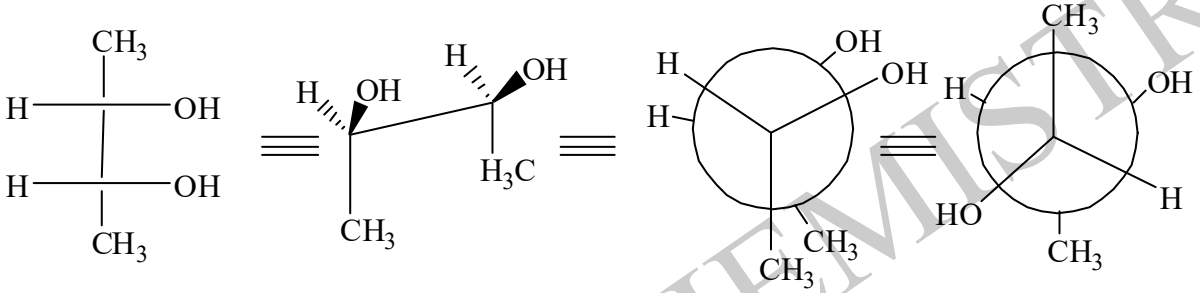
At carbon centre number (3)



(S) due to lowest priority group present on horizontal line

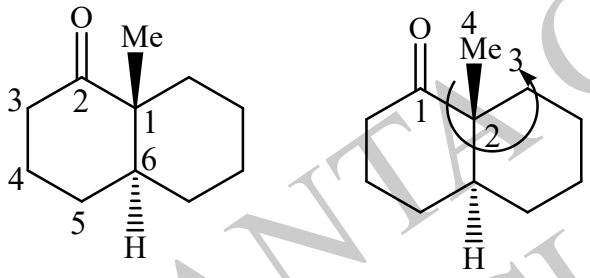
Correct option is (a)

4. Meso-2, 3 butanediol



Correct option is (a)

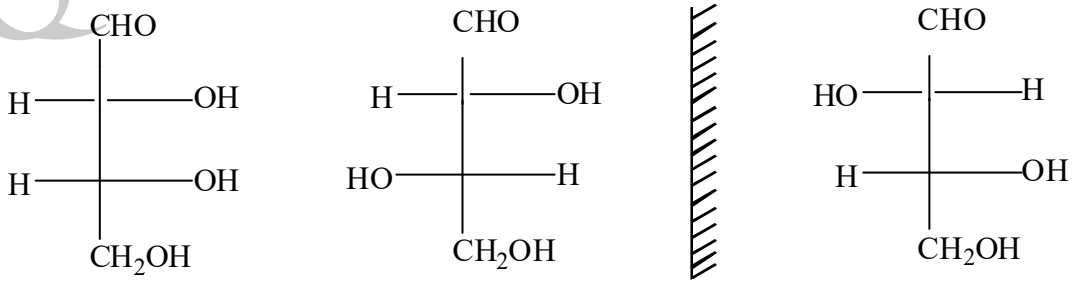
5.



1 (R) 6S

Correct option is (b)

6. (I) I and II are distereomers because they are not mirror image to each other.



I II III

II an III are enantiomers

(II) I and III are interconverted by a base catelysed isomerisation.

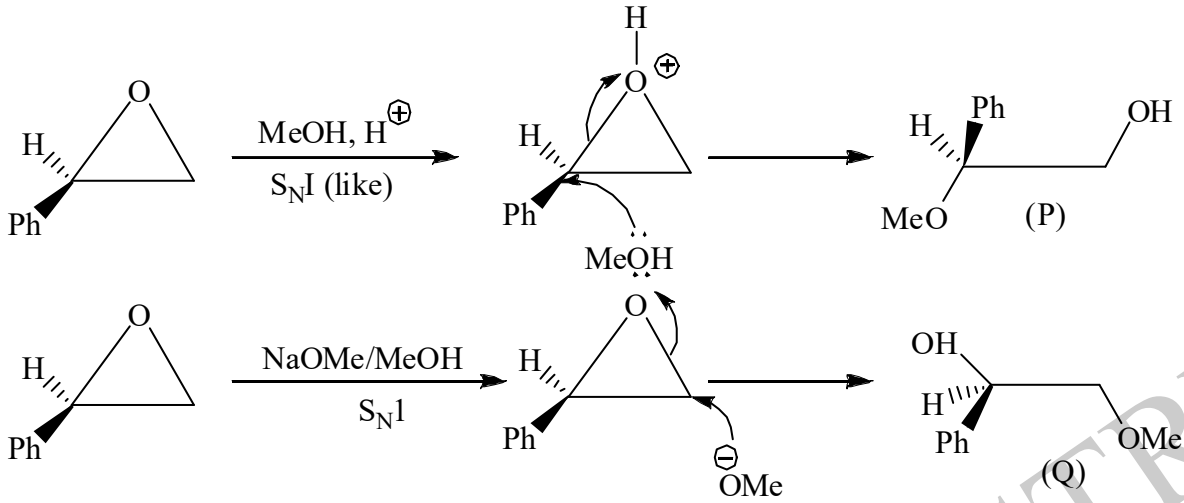
(III) Hydroxyl group present at first chiral carbon from bottom side, right side known as D-sugar. If lef side (OH group) known as L-sugar

So I and III are D-sugar and II and IV are L-sugar.

QUANTA CHEMISTRY CLASSES

Correct option is (b)

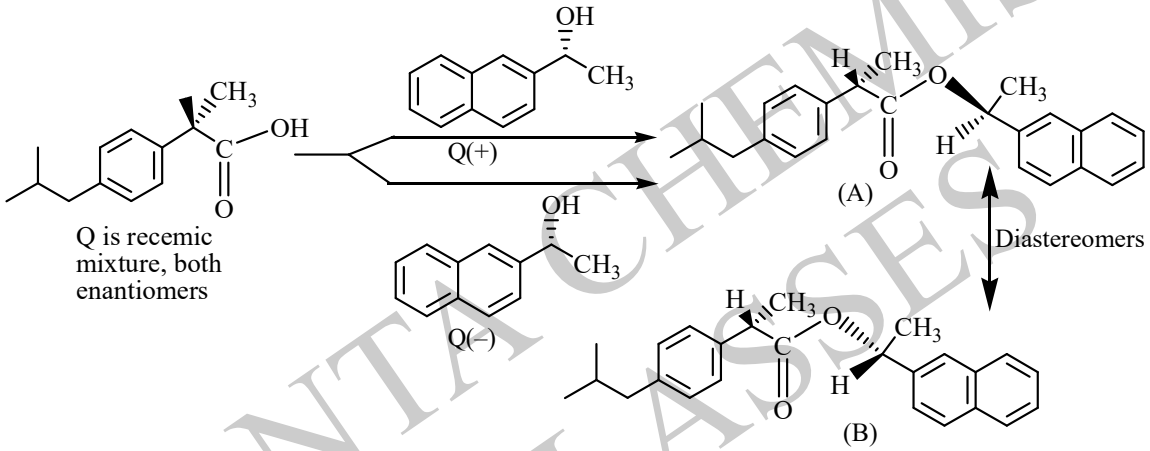
7.



So, P and Q are optically active and positional isomers.

Correct option is (d)

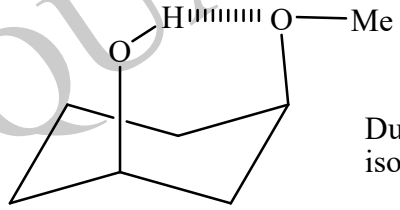
8.



Ae and B are the mixture of disaereomers.

correct option is (b)

9.

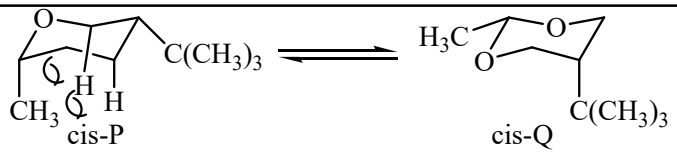


Due to hydrogen bonding, most stable isomer of 3-methoxycyclohexanol is (d)

Correct option s (d)

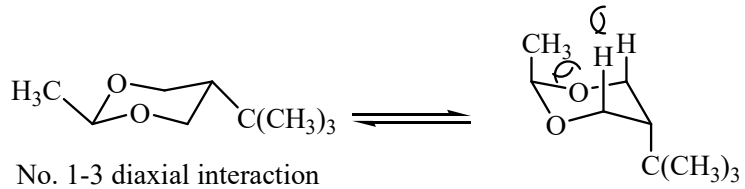
10. In, cis P and trans S, 1-3 diaxial interaction occur. Due to 1-3 diaxial interaction more repulsion occurs, isomers will be less stable.

QUANTA CHEMISTRY CLASSES



1-3 diaxial interaction
less stable

No. 1-3 diaxial interaction
more stable

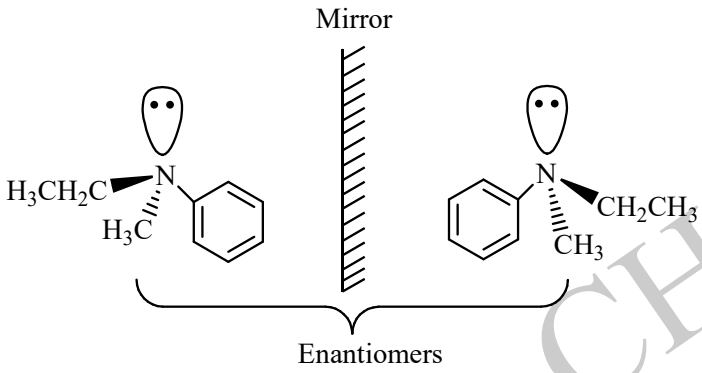


No. 1-3 diaxial interaction
more stable

1-3 diaxial interaction
less stable

Correct option is (d)

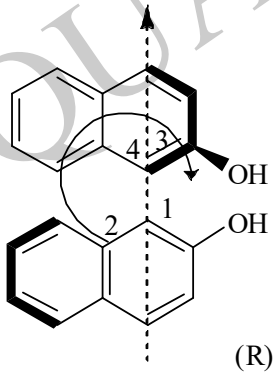
11.



- They are inter convertable to each other. Can't resolved. So they are optically inactive due to pyramidal inversion.
- Phosphorous compounds can not interconvertable to each other.
- in allene (terminal carbon present) atom are perpendicular to each other.

Correct option is (a)

12.

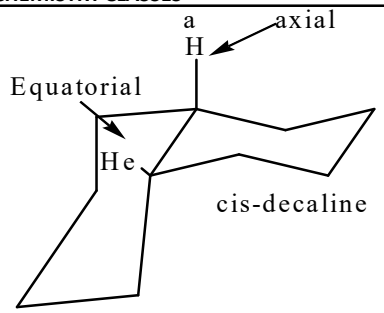


(R)

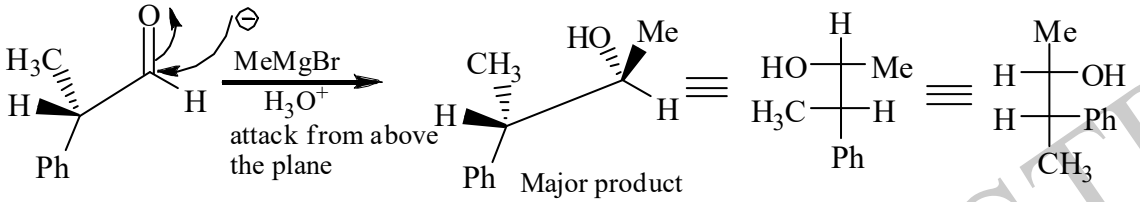
BnP is a optically active compound, since there is a absence of plane of symmetry.

Correct option is (a)

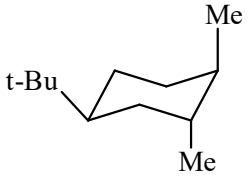
QUANTA CHEMISTRY CLASSES

13. 

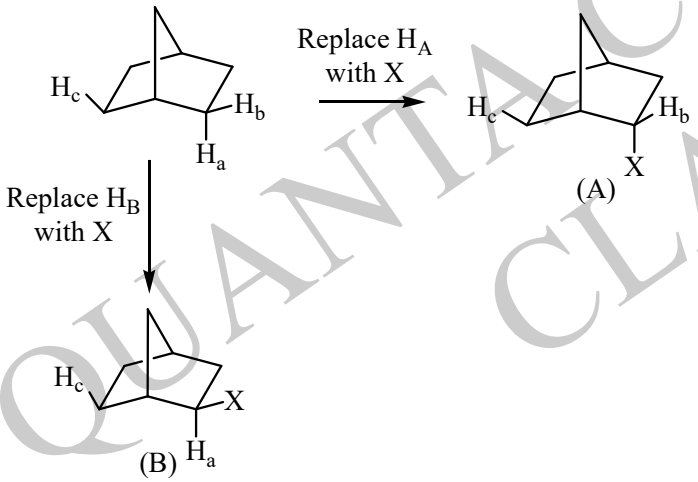
Correct option is (c)

14. 

Correct option is (c)

15. 

Correct option is (c)

16. 

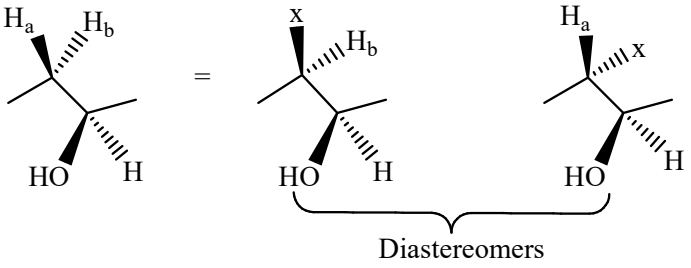
A and B are diastereomers, because the environment of H_a and H_b are different.

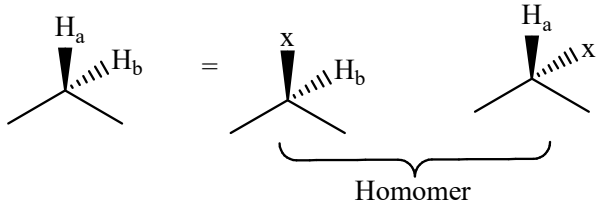
Hence, H_a and H_b are diastereotopic.

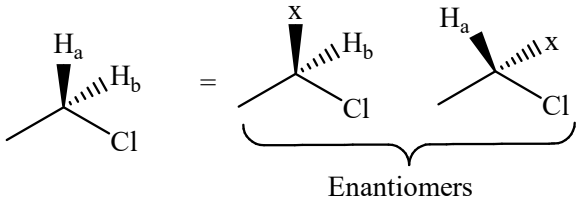
Correct option is (b)

QUANTA CHEMISTRY CLASSES

17.







Other method,

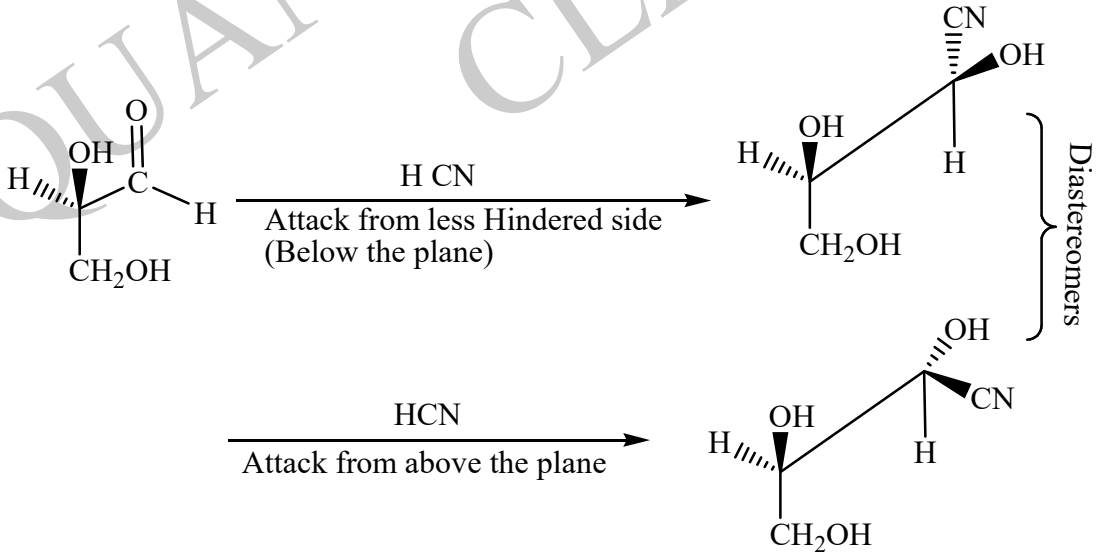
(I) In case I, H_a and H_b are diastereotopic.

(II) In case II, C_2 symmetry present so they are homotopic.

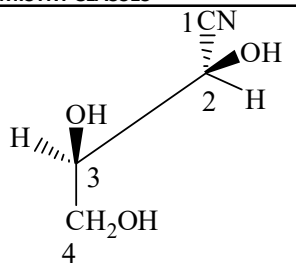
(III) In case III. H_a and H_b reflect through the plane, so they are enantiotopic.

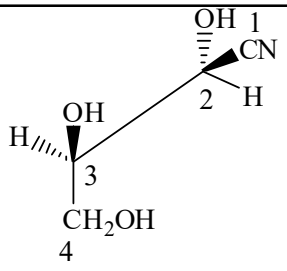
Correct option is (c)

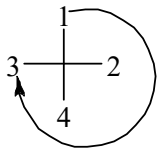
18.



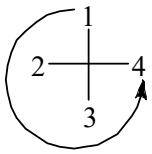
QUANTA CHEMISTRY CLASSES



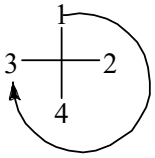




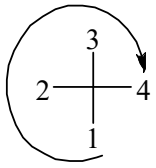
3R



2R



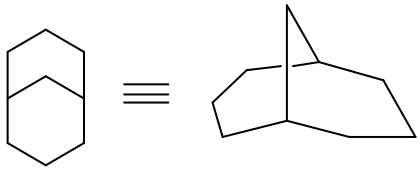
3R



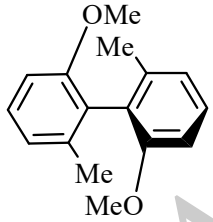
2S

Correct option is (a)

19. (A) Bridged system : In which carbon joined to each other by three different chain of carbon exist in different plane.

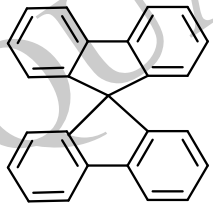


(B) Atropisomerism : Isolable stereoisomers resulting from restricted rotation about single bond are called atropisomers.

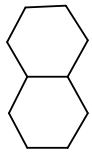


= Due to bulky group, present at ortho position, the rotation along the single bond is restricted.

(C) Spiro system : When the two rings are shared by only one carbon atom called a spiro compound.



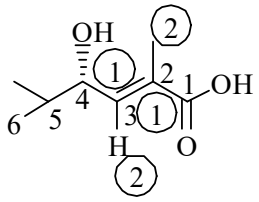
(D) Fused system : When two rings can share a pair of adjacent carbon the arrangement is called a fused bicylic system.

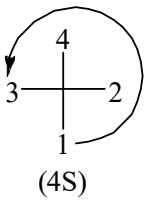


Correct option is (d)

QUANTA CHEMISTRY CLASSES

20.



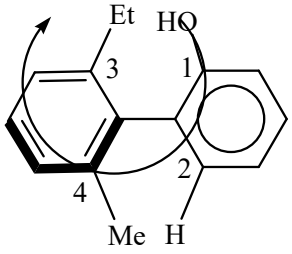


2E, 4S

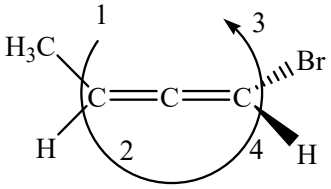
(4S)

Correct option is (d)

21.



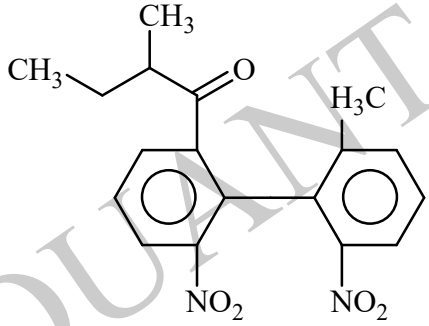
Movement is clockwise and 4th group is above the plane So, 'S'



Movement is anticlockwise but the 4th group is above the plane. So, it is R

Correct option is (b)

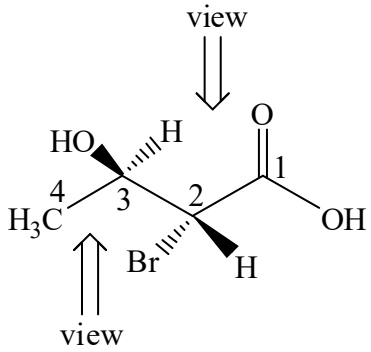
22.



One chiral centre
So, two stereoisomers are possible
Two isomer will be obtained due to restricted rotation.
So, total number of possible stereoisomer
will be four.

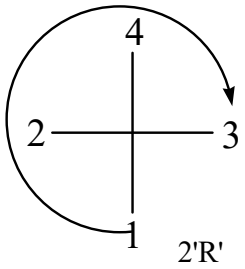
Correct answer is 4

23.

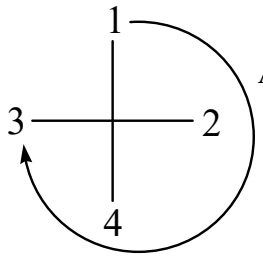


At carbon number 2 (priority Acc. to CIP rule) At carbon number 3 (priority Acc. to CIP rule)

QUANTA CHEMISTRY CLASSES



2'R'

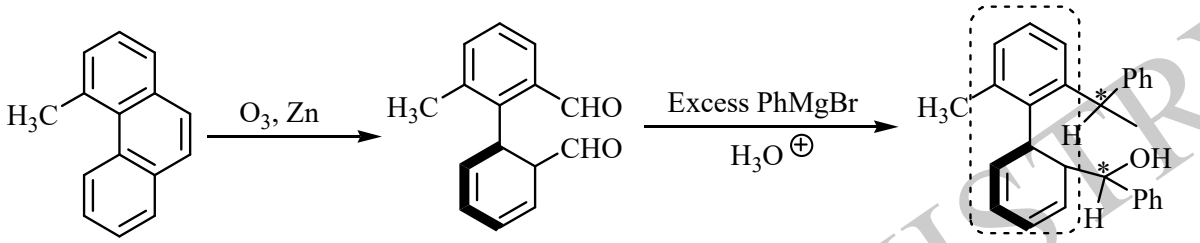


At carbon centre-3

3'R'

Correct option is (d)

24.

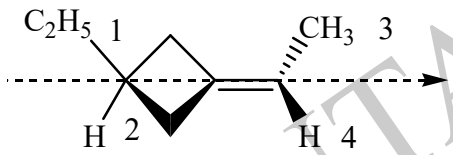


Total n = 3

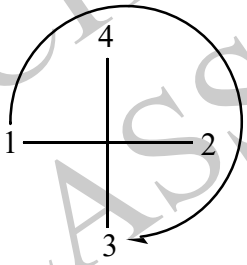
Possible stereoisomers = $2^3 = 8$

Correct option is (8)

25.

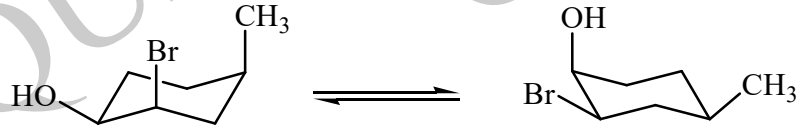


R Configuration



Correct option is (a)

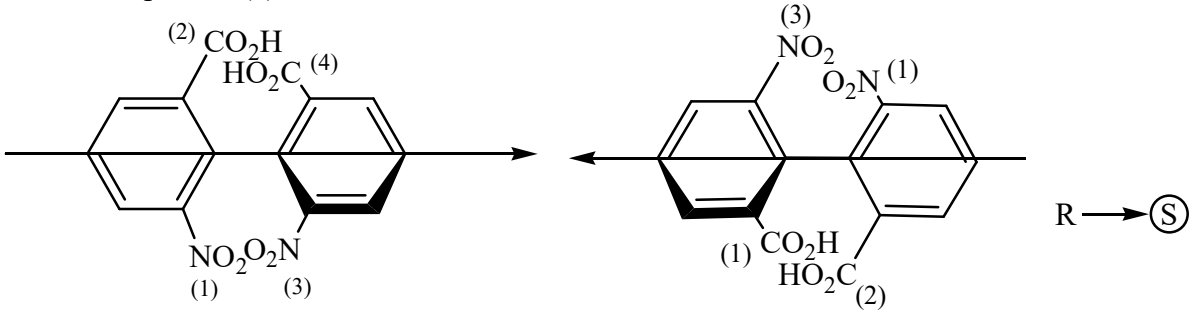
26.



On ring flipping axial bond convert into equatorial and quatorial convert into axial bond.

Correct option is (b)

27.



QUANTA CHEMISTRY CLASSES

$\therefore$ Both are enantiomers.

Hence the correct option is (d)

28. $[\alpha]_R = -112$ $[\alpha]_S = +112$

$[\alpha]_{sol.} = -82.88$

$\alpha_{sol} = \alpha_R + \alpha_S$

Let conc. of the sol. is 1

Let conc. of the R 2-bromobutane is (x)

then conc. of the S 2-bromobutane is (1 – x)

$$[\alpha]_{sol}\ C_{sol}\ \ell = [\alpha]_R C_R \ell + [\alpha]_S C_S \ell$$

$$-82.88 \times 1 = -112 \times x + 112\ (1 - x)$$

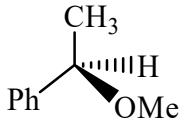
$$-82.88 = -224x + 112$$

$$-194.88 = -224x$$

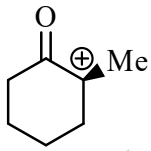
$$x = \frac{-194.88}{-224} = 0.87$$

% of R-2 bromobutane is 87%

% of S-2 bromobutane is 13%

29. 

Has a chiral centre $\therefore$ It has no P.o.S., Hence optically active.

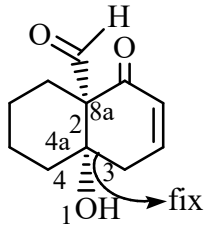


Has one chiral centre $\therefore$ It has no P.o.S., Hence optically active.

Rest all the structures are optically inactive

So total (4) structures are optically inactive

Correct answer is 4.

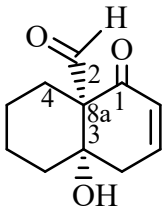
30. 

Fix 3rd priority and rotate 1, 2 and 3.

$1 \rightarrow 2 \rightarrow 3$ (anticlockwise)

So, configuration of 4a centre is S.

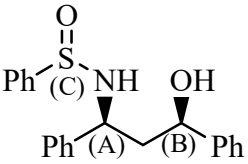
QUANTA CHEMISTRY CLASSES



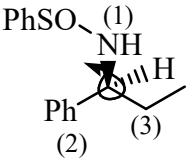
Similarly, here fix I[st] priority and rotate 2, 3, 4

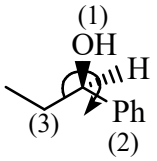
then rotate $1 \rightarrow 2 \rightarrow 3$ (clockwise)

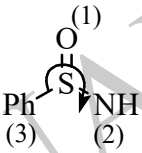
So, configuration of 8a centre is R.

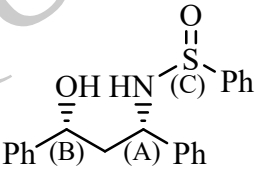
31. 

There are 3 chiral centres

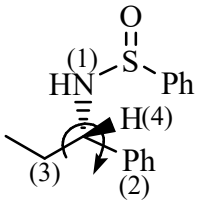
(A)  S configuration

(B)  R configuration

(C)  R configuration

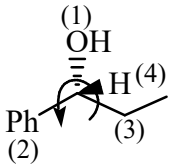


There are 3 chiral centres

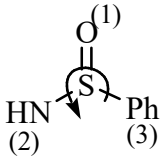
(A) 

[The least priority group on wedge so configuration is S)

QUANTA CHEMISTRY CLASSES

(B) 

[The least priority group on wedge so configuration is R]

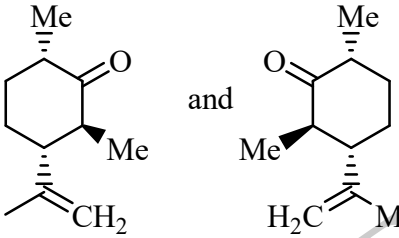
(C) 

(S configuration)

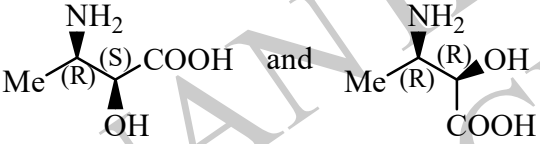
Chiral centre	A	B	C
I	S	R	R
II	S	R	S

Hence there is a diastereomeric relation ret

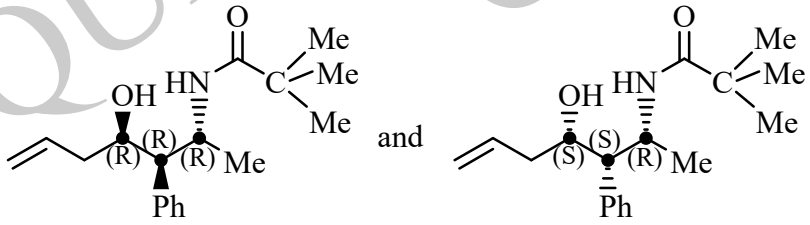
Structure (1) and (2)



Both the structure shows the diastereomeric relations

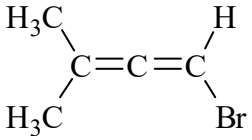


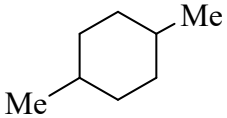
Both structures have diastereomeric relation



Both structures have diastereomeric relation

32. The number of compound(s) which can exhibit stereoisomerism is 6.



and 

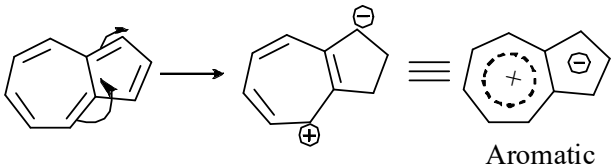
contains plane of symmetry, hence do not show stereoisomerism

rest all the given molecules show stereoisomerism.

$\therefore$ Correct answer is 6.

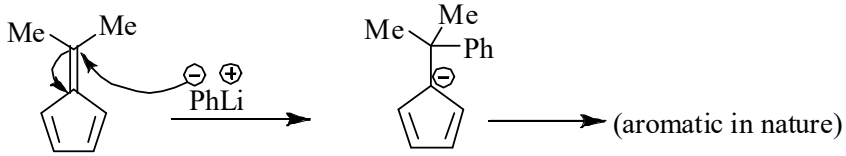
QUANTA CHEMISTRY CLASSES

HINTS & SOLUTIONS

1. 

Aromatic

Correct option is (a)

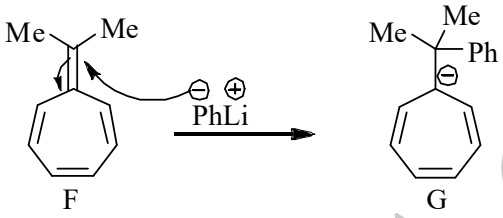
2. 

Compound E

Compound (E) follow huckel rule, containing 6π electron system.

After the addition of Ph^- an ion attains aromaticity.

So easly react.



F G

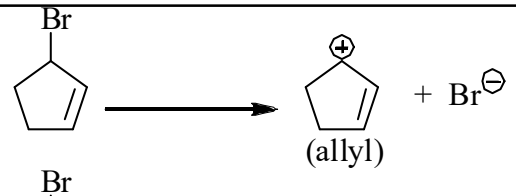
8π electron system (Anti-aromatic)

Compound (F) react with PhLi, form 8π electron system which are not aromatic in nature. Anti-aromatic compound are less stable.

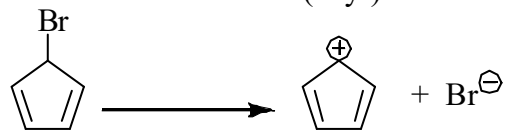
So Ph^- not react with compound (F).

3. S_N1 reactione in the following compounds

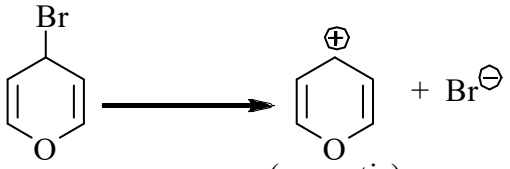
QUANTA CHEMISTRY CLASSES



(allyl)



(antiaromatic)



(aromatic)

Order of reactivity in SN^1 depends upon the stability of carbocation.

Stability of carbocation with reactivity n S_N1 reaction.

In Case-III-Formation of most stable carbocation due to aromaticity

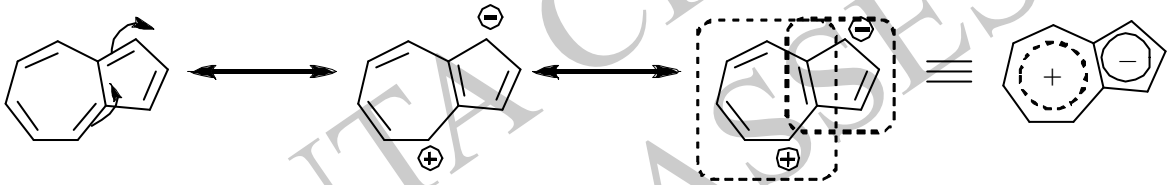
In Case-II-Carbocation destabilize due to formation of anti-aromatic cation

In Case-I- Carbocation stabilise by allylic carbocation formation.

So, Correct order is III > I > II

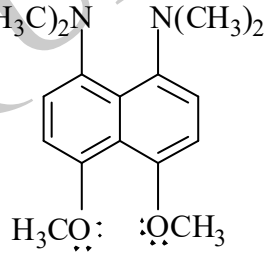
Correct option is (c)

4.



Both rings contain $6\pi e^-$, follow Huckel rule

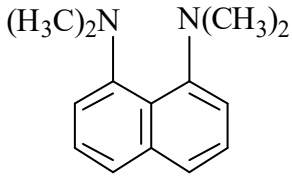
Correct option is (b)

5. (Z) 

$pK_a = 13.9$

Due to +M effect high electron density on nitrogen atom.

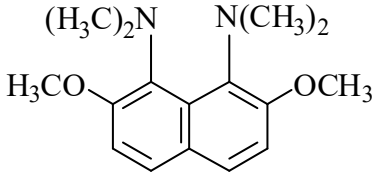
So, more basic than (X)

(X) 

$pK_a = 12.1$

Lone pair present on nitrogen atom delocalization with ring so less as compare to (Z)

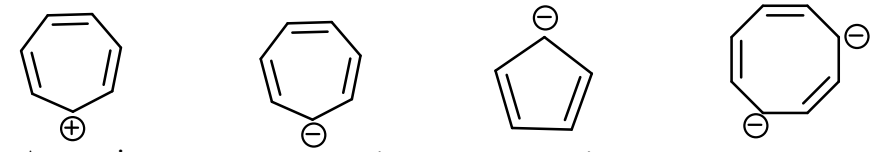
QUANTA CHEMISTRY CLASSES

(Y)  $pK_a = 16.1$

Due to SIR effect most basic in nature.

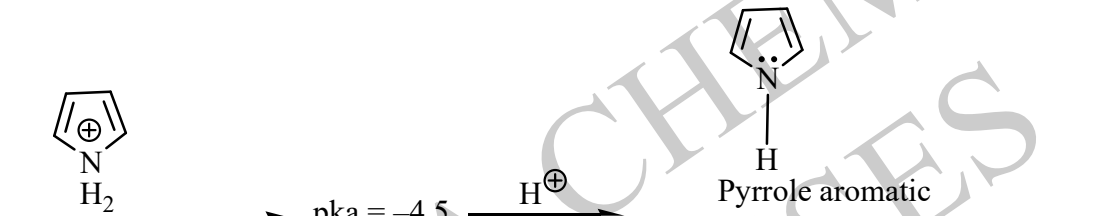
So correct order of basicity, X < Z < Y.

Correct option is (c)

6. 

Aromatic 6π electron | Non-aromatic due to non-planarity | aromatic 6π electron | Aromatic 10π electron

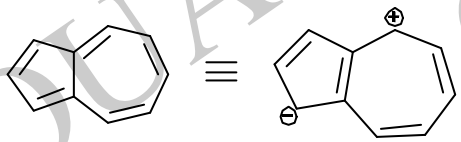
Correct option is (b)

7. 

Non-aromatic (Highly acidic) — pka = –4.5 — Pyrrole aromatic

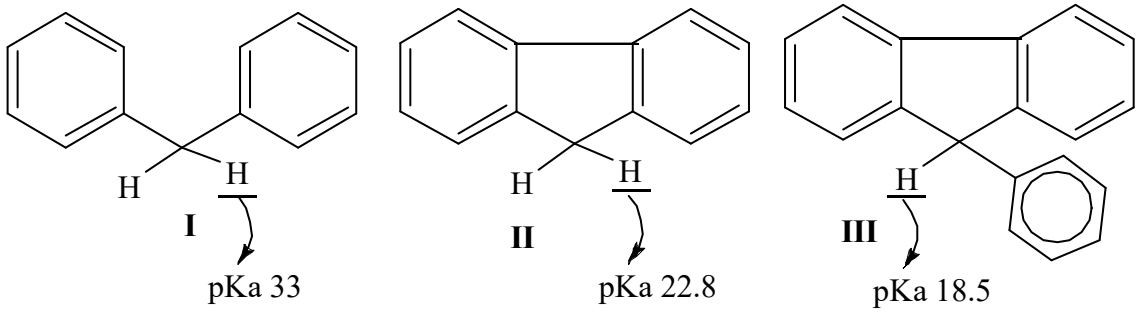
Lone pair is in delocalization within the ring hence not available for protonation

Correct option is (b)

8. 

aromatic in nature containing charge seperation

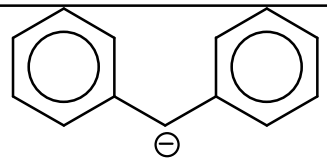
Correct option is (a)

9. 

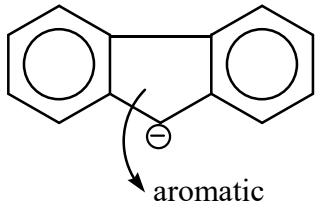
I — pKa 33 | II — pKa 22.8 | III — pKa 18.5

As the value of pKa decreases acidity increases

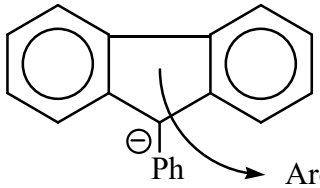
QUANTA CHEMISTRY CLASSES



Conjugated base of I (resonance stabilised)



Conjugated base of II (Aromaticity stabilised)



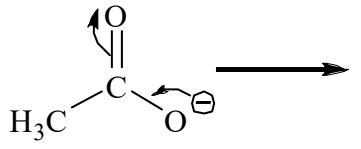
Aromatic + extended conjugation due to Ph.

As the stability of conjugate bas increases acidity increases.

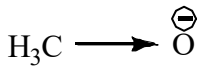
So, the order of acidity is III > II > I.

Correct option is (c)

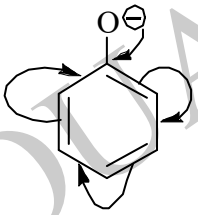
10. Nucleophilicity depends on donor ability.



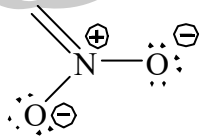
Equivalent conjugate ion



+I effect



Negative charge conjugate with phenyl ring



Negative charge stabilise with –R as well as –I effect

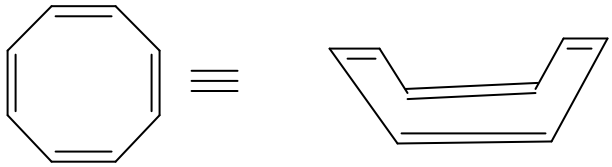
As the stability of negative charge increases its nucleophilic behaviour decrease.

Correct order of nucleophilicity

$CH_3O^- > C_6H_5O^- > CH_3CO_2^- > NO_3^-$

Correct option is (c)

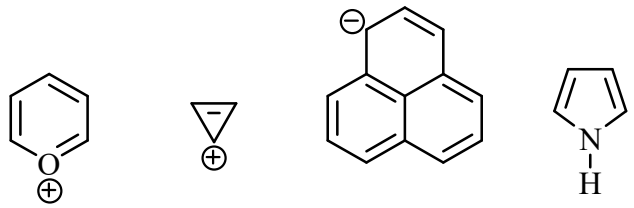
QUANTA CHEMISTRY CLASSES

11. 

Tup shaped

COT has tub shape and is non-plannar hence non-aromatic

Correct option is (a)

12. 

These 4 are aromatic species

QUANTA CHEMISTRY CLASSES

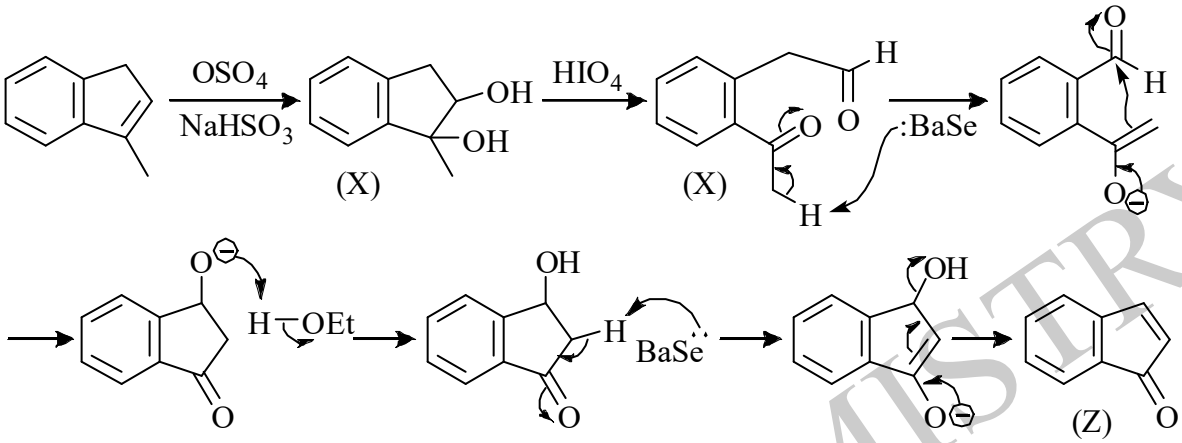
QUANTA CHEMISTRY CLASSES

3

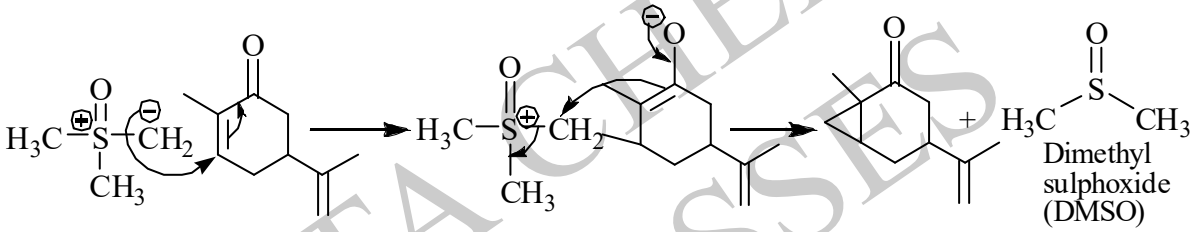
ORGANIC SYNTHESIS & REARRANGEMENTS

HINTS & SOLUTIONS

1.



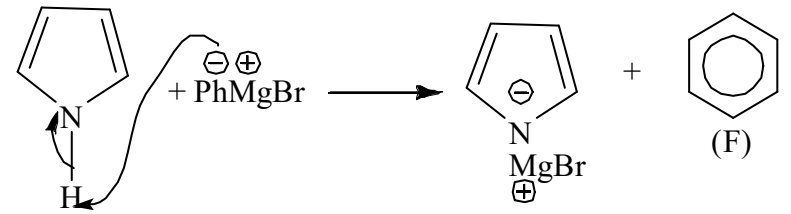
2. With Sulphonium ylide or sulphoxine ylide, conjugate addition takes place for the formation of cyclopropane.

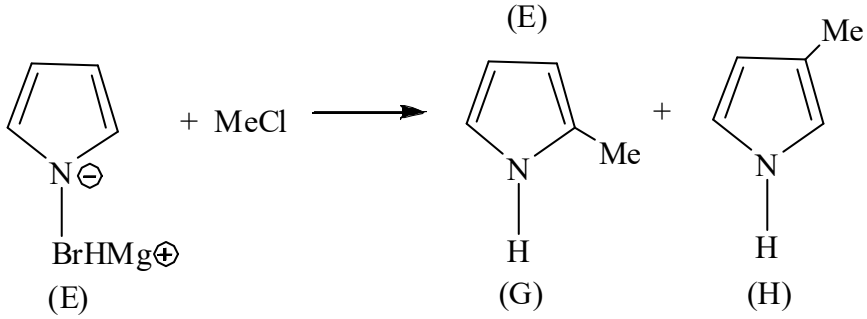


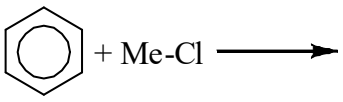
Correct option is (c)

QUANTA CHEMISTRY CLASSES

3.







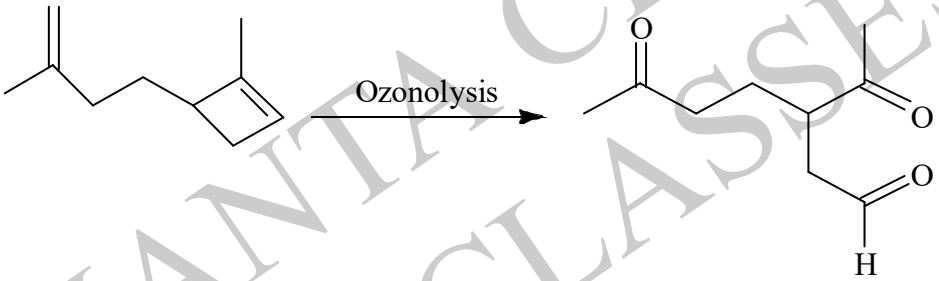
NO reaction because nucleophile is not very strong to attack weak electrophile

Me–Cl

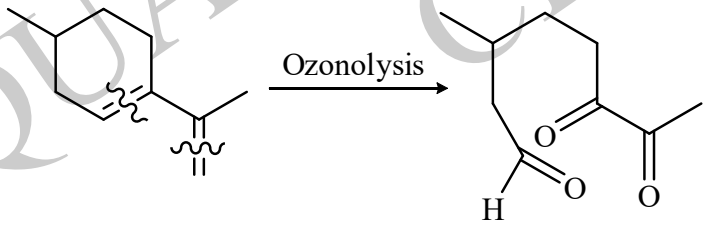
Hence, it require lewis acid to make MeCl strong electrophile.

Correct option is (a)

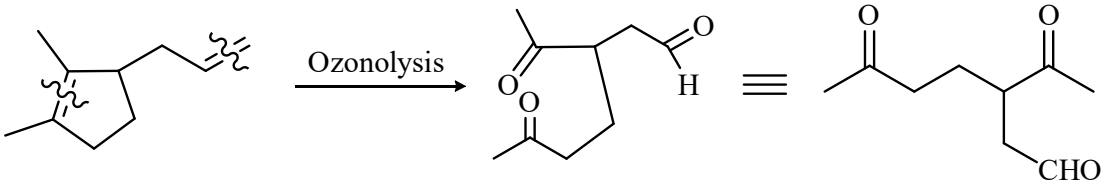
4. **(i)**



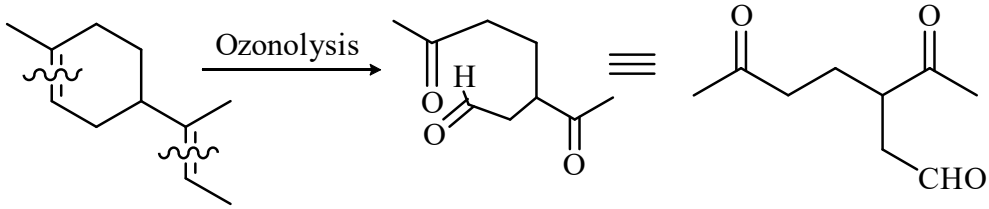
(ii)



(iii)



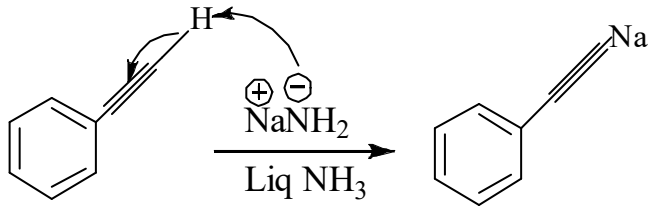
(iv)



Correct answer is (I) and (III)

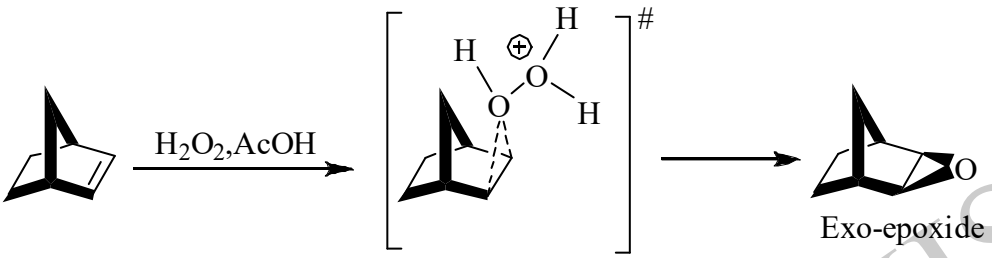
QUANTA CHEMISTRY CLASSES

Correct option is (b)

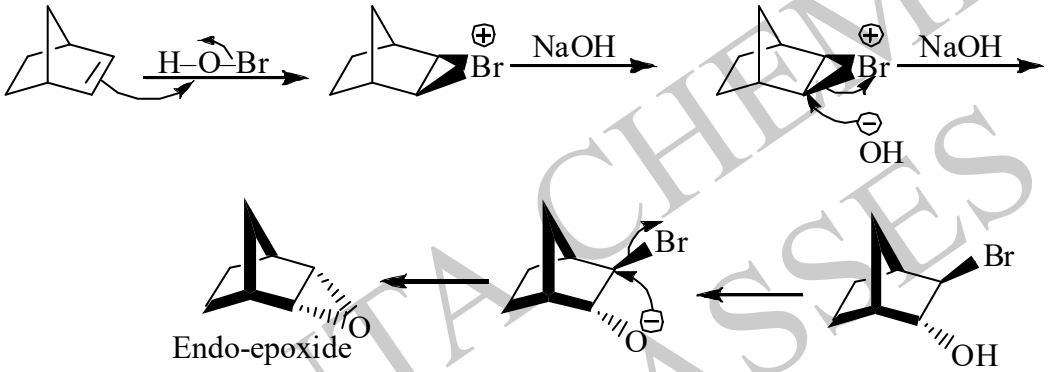
5. 

Correct option is (b)

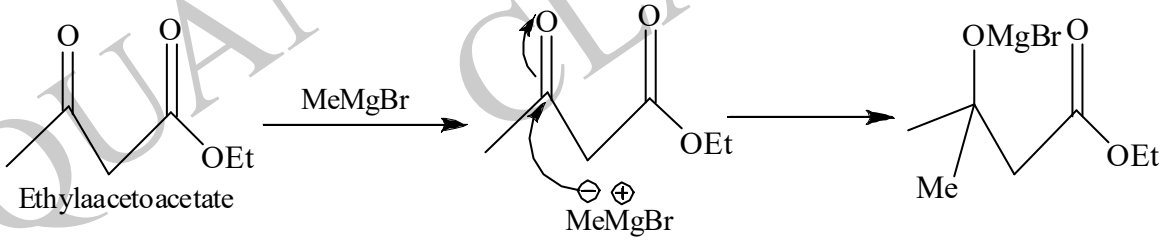
6. Epoxidation with peroxy-acid occured preferentially on the less hindered face.



Bromination is formed less hinered side and base attack through S_N2 mechanism



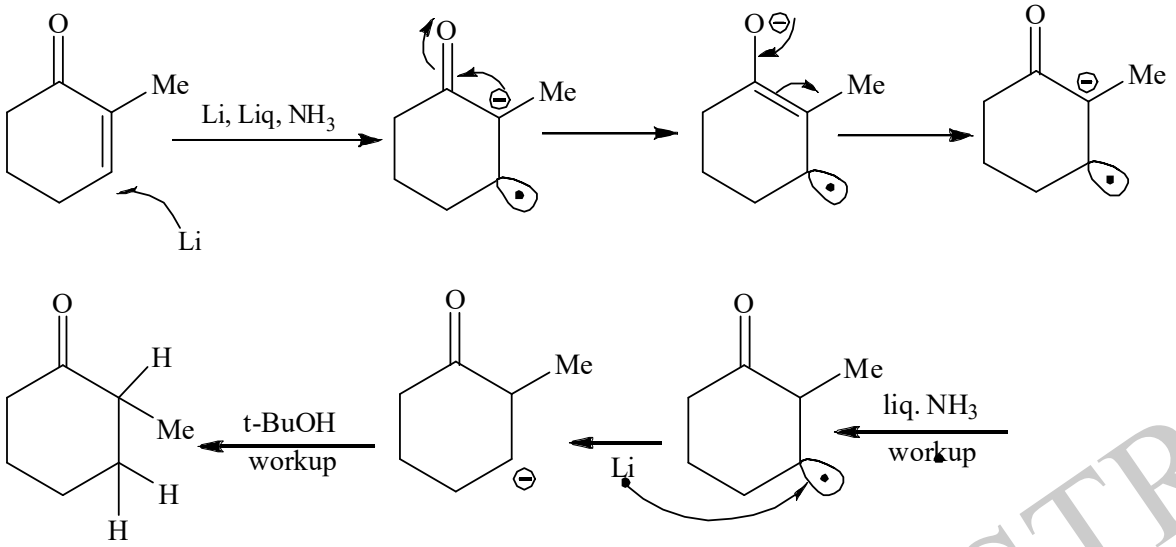
Correct option is (d)

7. 

Correct option is (a)

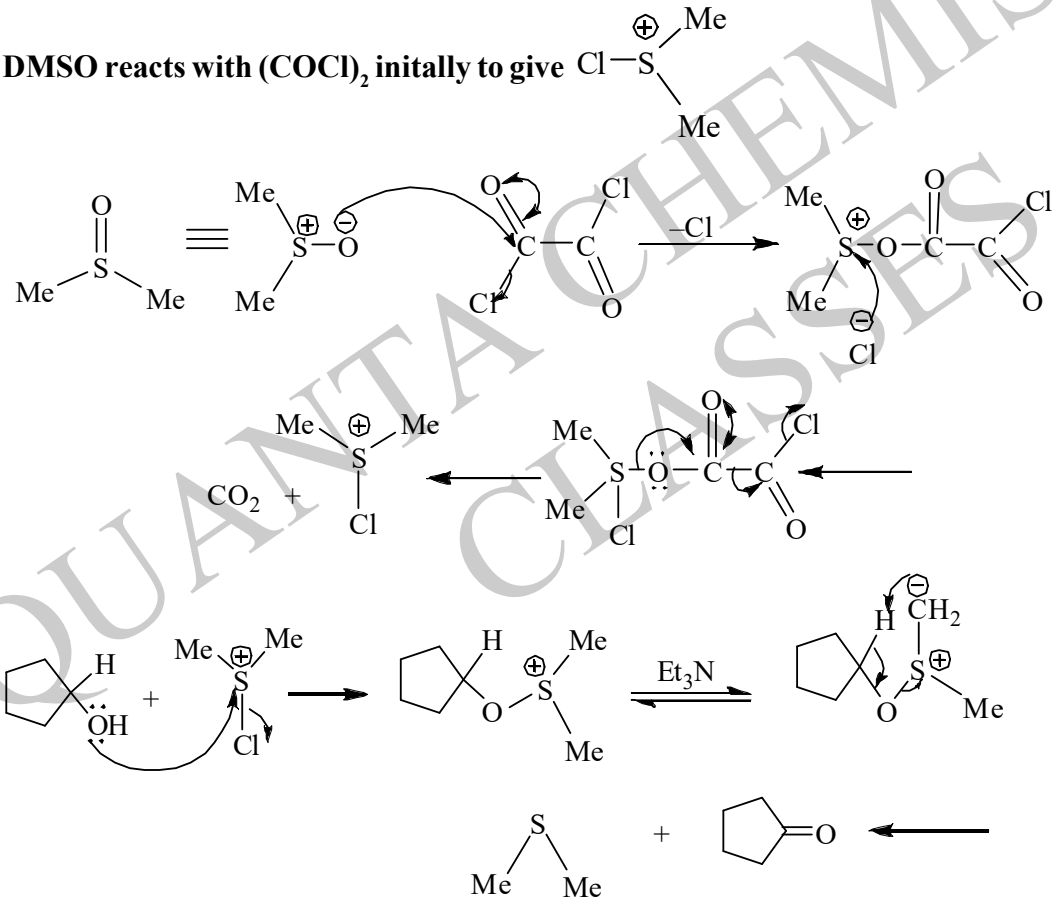
QUANTA CHEMISTRY CLASSES

8.



Correct option is (c)

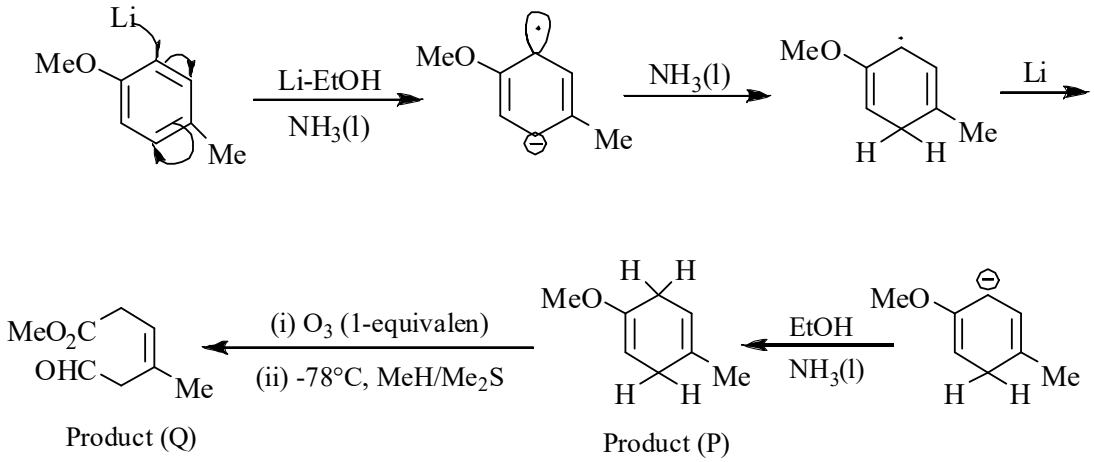
9. DMSO reacts with $(COCl)_2$ initally to give



Correct option is (c)

QUANTA CHEMISTRY CLASSES

10.



Product (Q) Product (P)

Ozonolysis occurs on electron rich double bond.

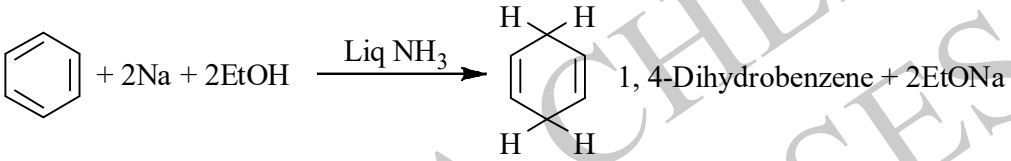
In the presence of MeH/Me_2S reductive ozonolysis takes place.

Correct option is (d)

11. **Na $(CH_3COO)_3$ BH selective reducing agent for aldehyde.**

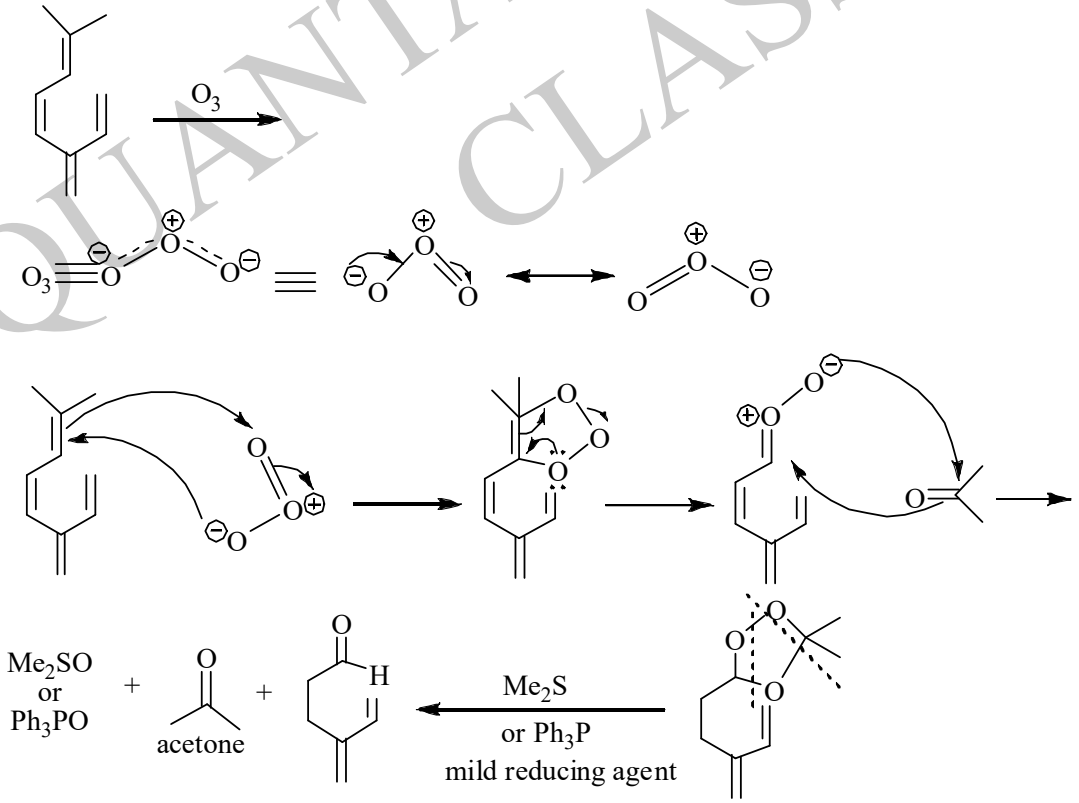
Correct option is (c)

12. Birch Reaction :



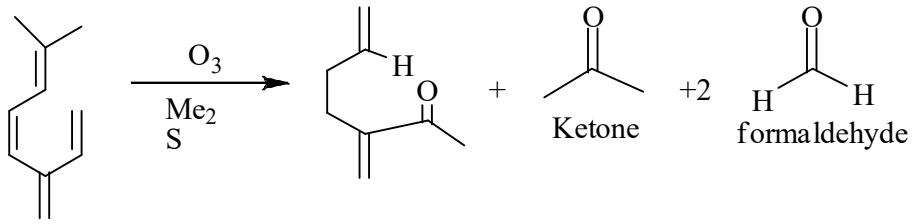
Correct option is (a)

13.

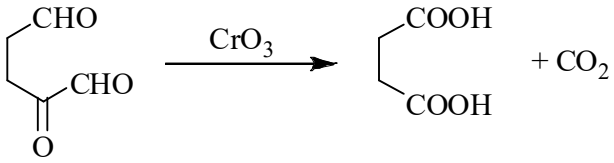


Same ozonolysis (mechanism) on remaining both double bond observed product is

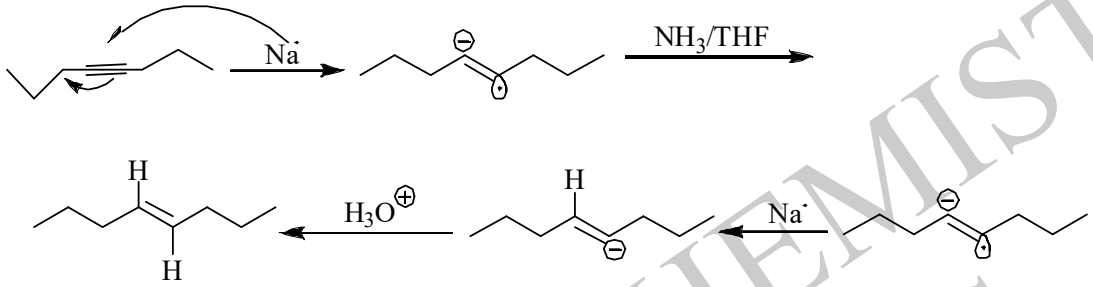
QUANTA CHEMISTRY CLASSES



Correct option is (b)

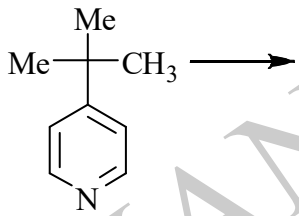
14. 

Correct option is (a)

15. 

Correct option is (c)

16. Compound which lack benzylic hydrogen is not oxidized by $KMnO_4$.

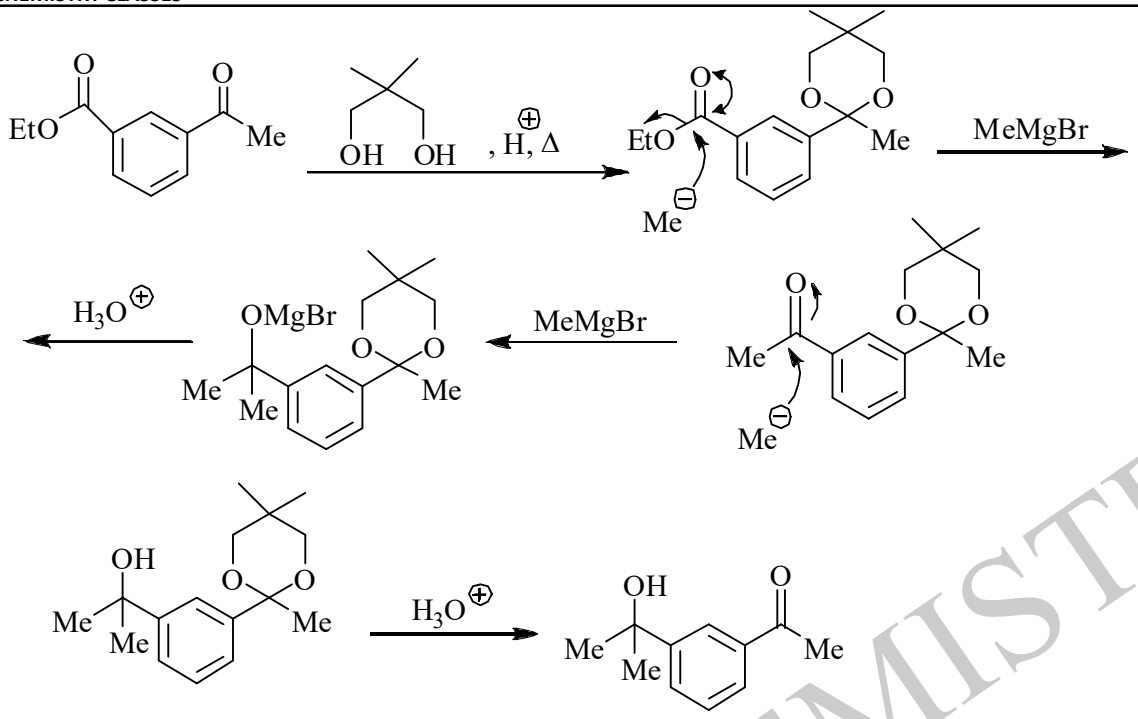


No Benzylic hydrogen in the compound hence will not be oxidized by $KMnO_4$.

Correct option is (d)

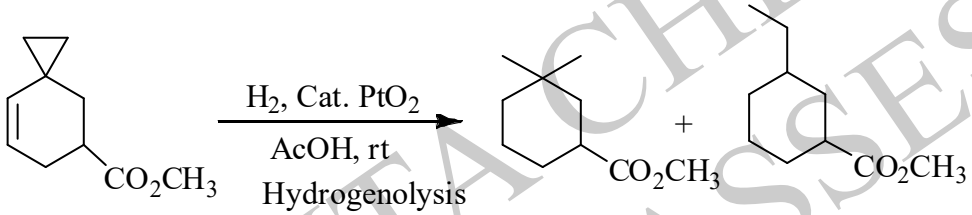
17. 1-3 diols protect ketone (group selectivity)

QUANTA CHEMISTRY CLASSES



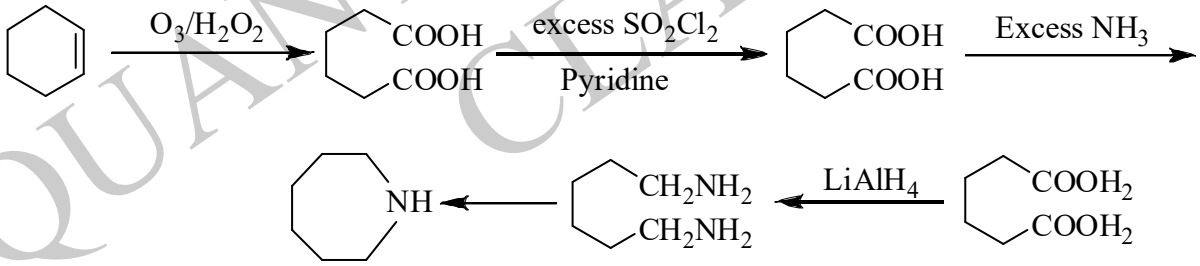
Correct option is (b)

18. PtO_2 preffered the reduction of highly strained cyclopropane ring over double bond



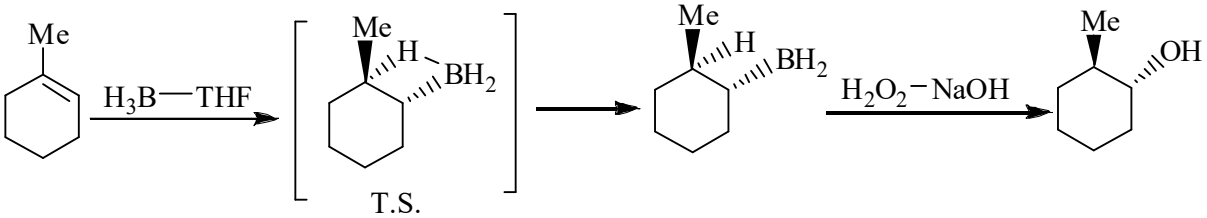
Correct option is (c)

19.



Correct option is (a)

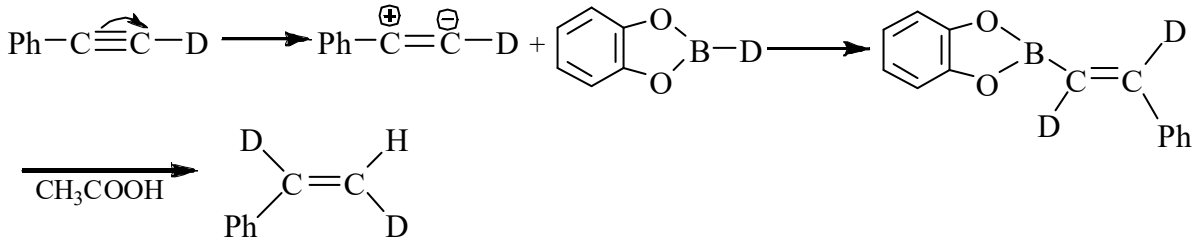
20.



Correct option is (b)

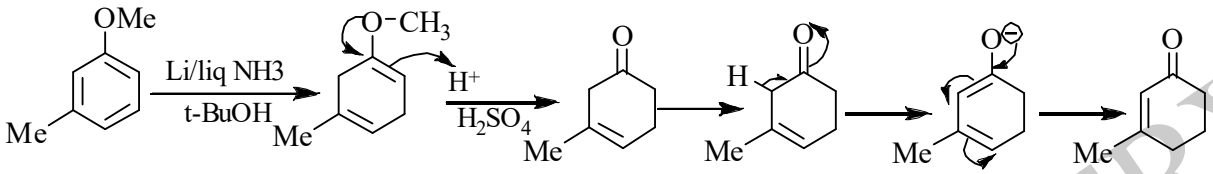
QUANTA CHEMISTRY CLASSES

21.



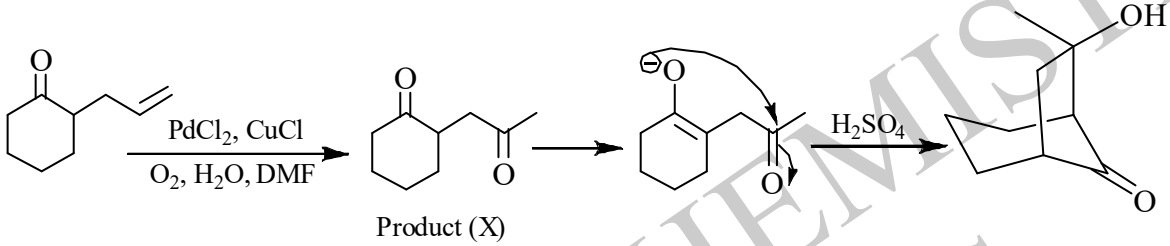
Correct option is (c)

22.



Correct option is (d)

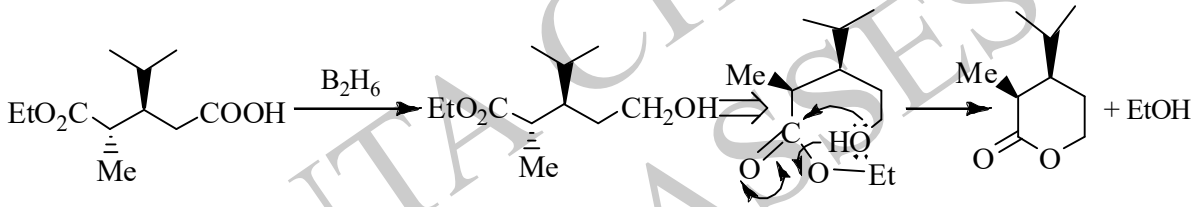
23.



Product (X)

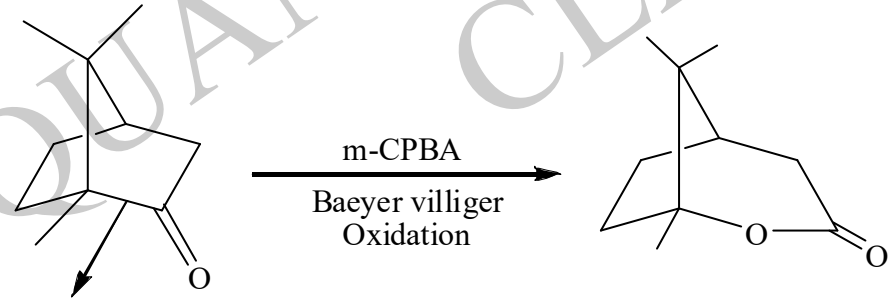
Correct option is (c)

24.

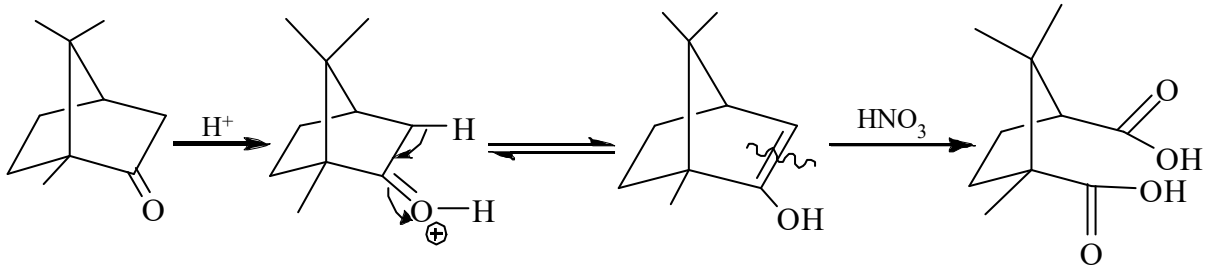


Correct option is (b)

25.



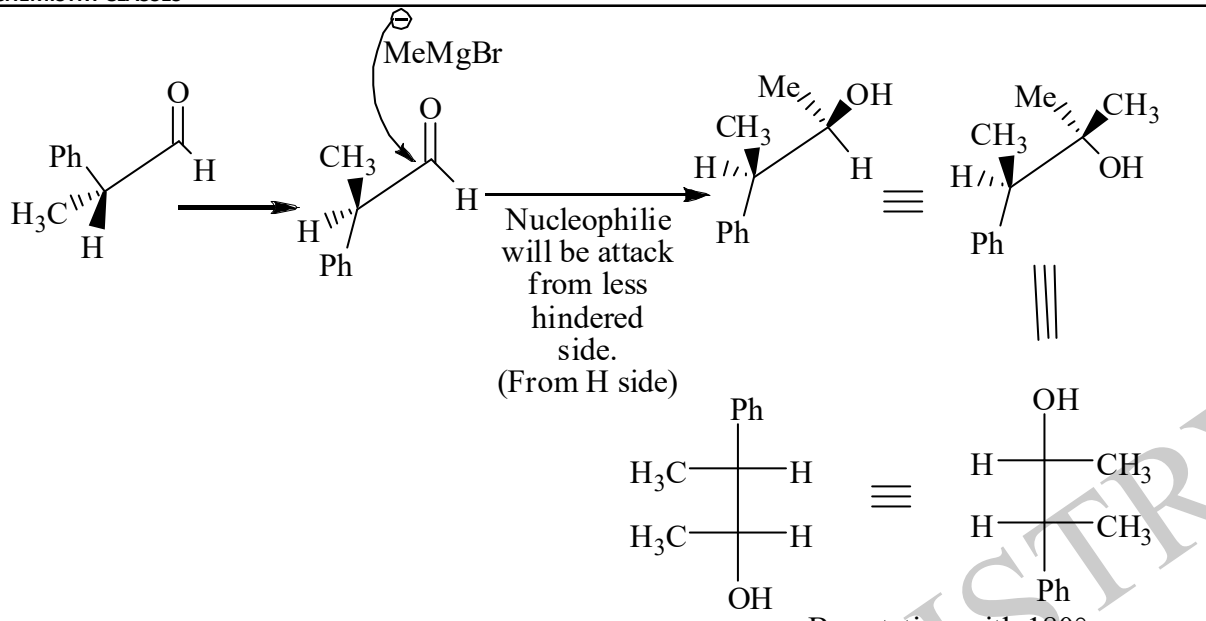
high migrating ability



Correct option is (b)

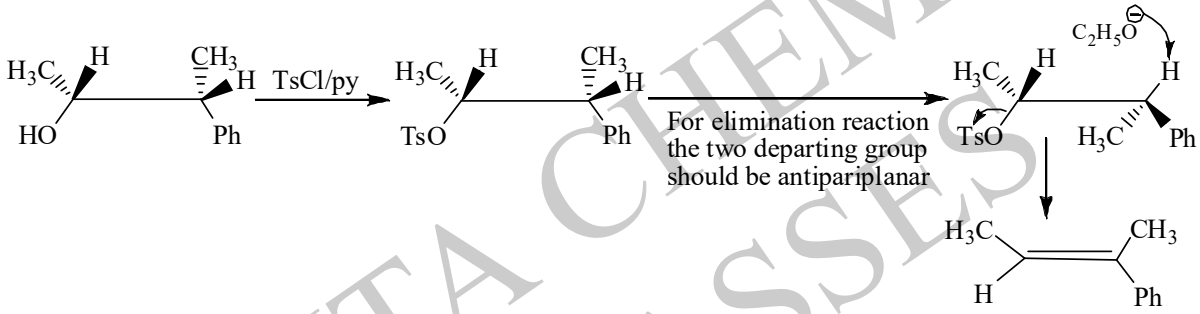
26. Cram's rule is applicable.

QUANTA CHEMISTRY CLASSES



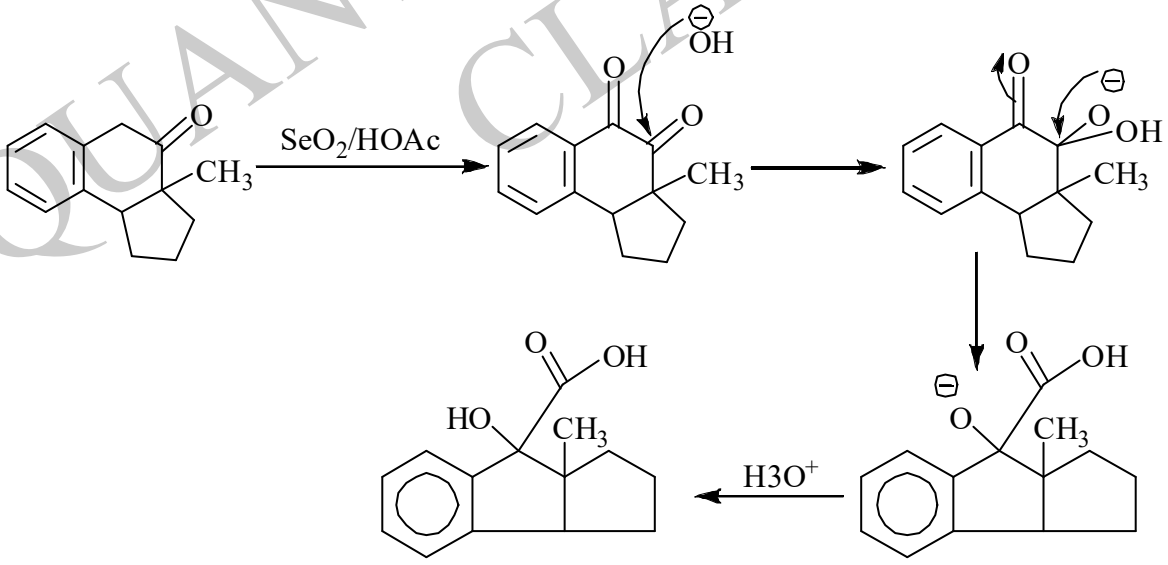
Correct option is (c)

27.



Correct option is (c)

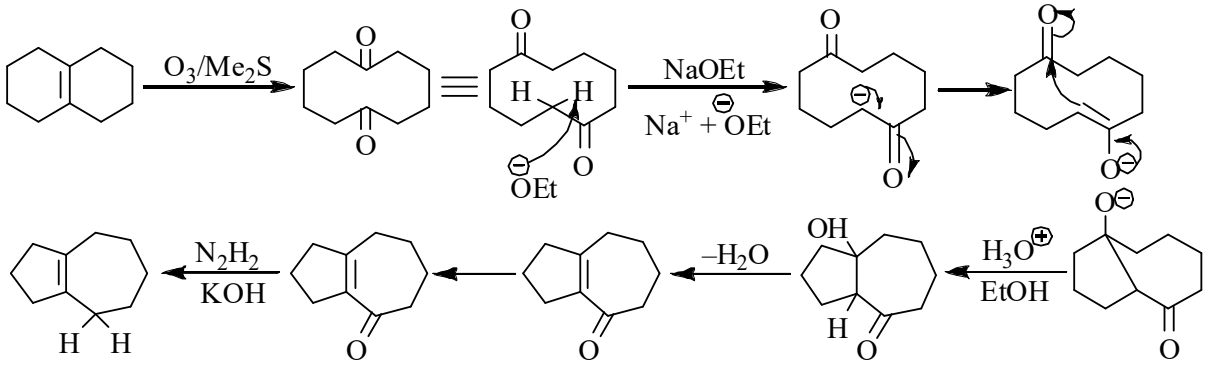
28.



Correct option is (c)

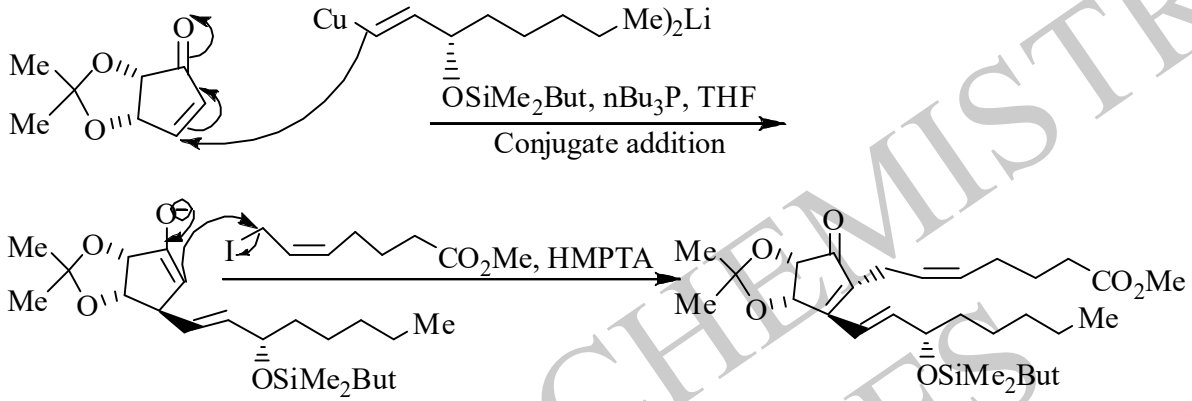
QUANTA CHEMISTRY CLASSES

29.



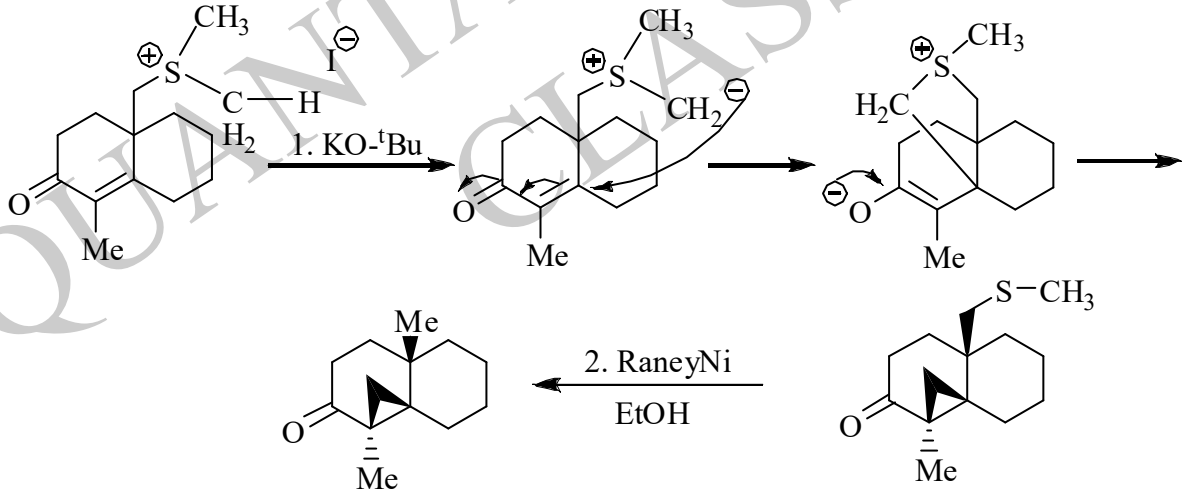
Correct option is (d)

30.



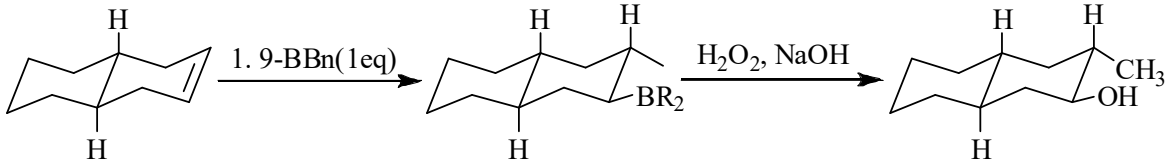
Correct option is (a)

31.



Correct option is (b)

32.

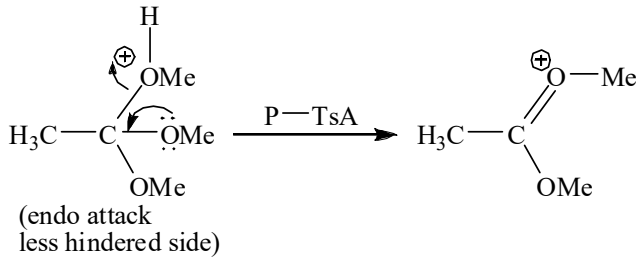


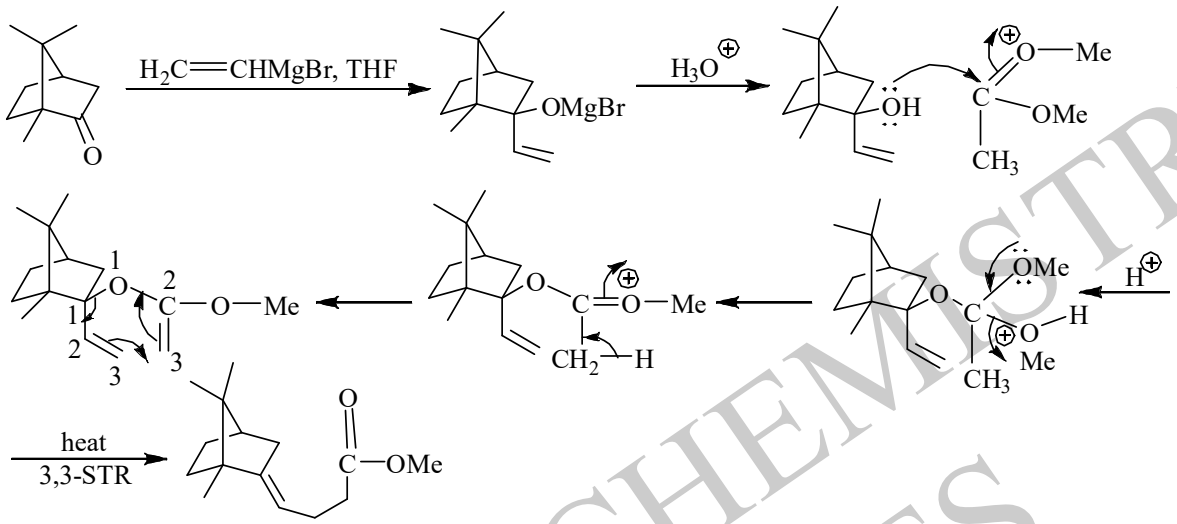
In the case of (A)

Hydroboration occurs in syn number on double bond. Hydrogen present on axial position due to less 1-3 diaxial interaction than CH_3, which present on equatorial position.

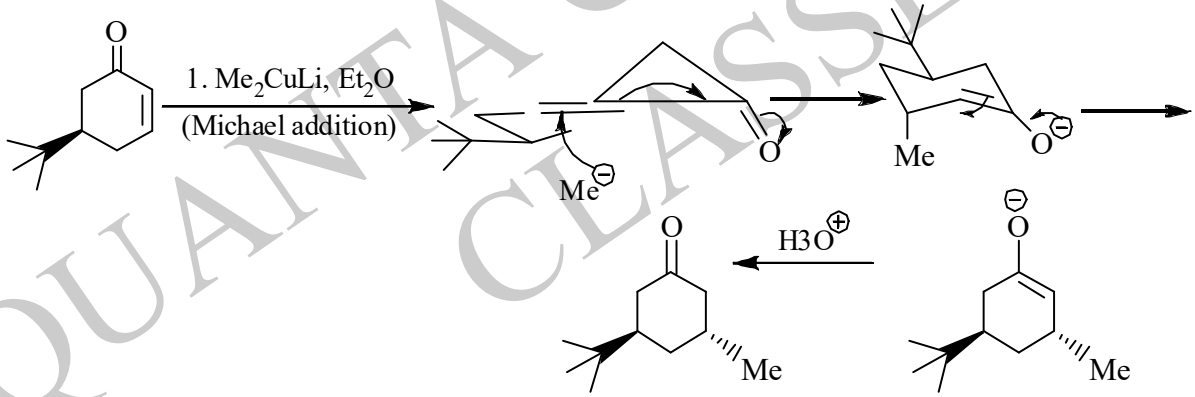
QUANTA CHEMISTRY CLASSES

Correct option is (a)

33. 

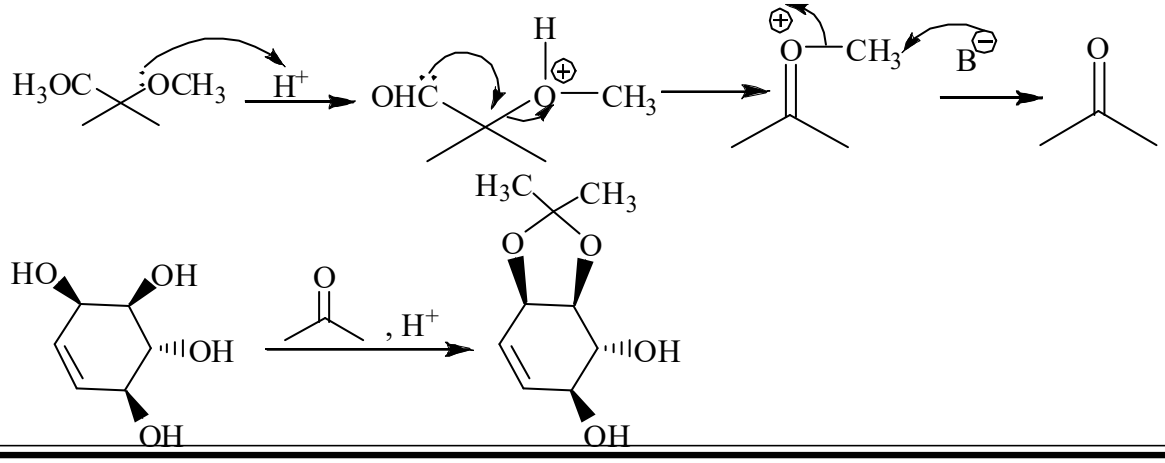


Correct option is (c)

34. 

Correct option is (d)

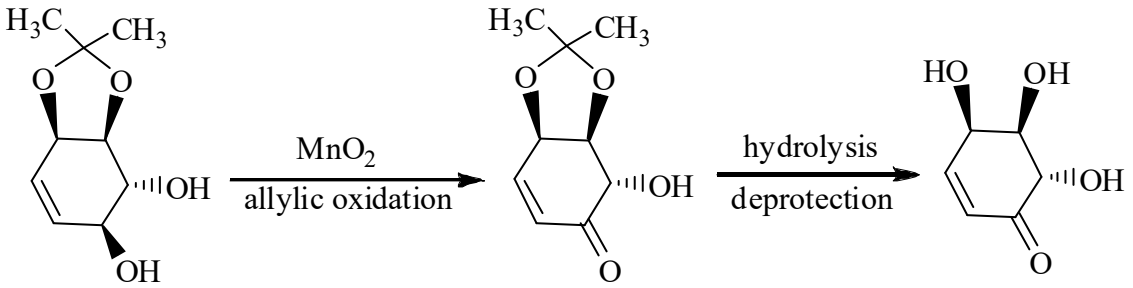
35. cis-diol undergoes protection faster than that of trans–diol.



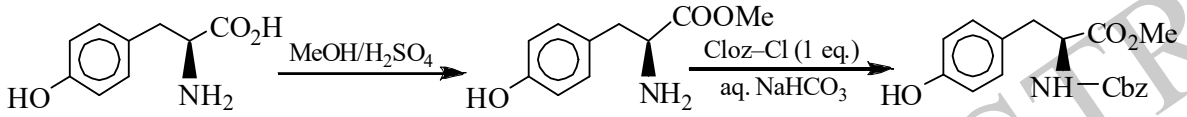
QUANTA CHEMISTRY CLASSES

Correct option is (c)

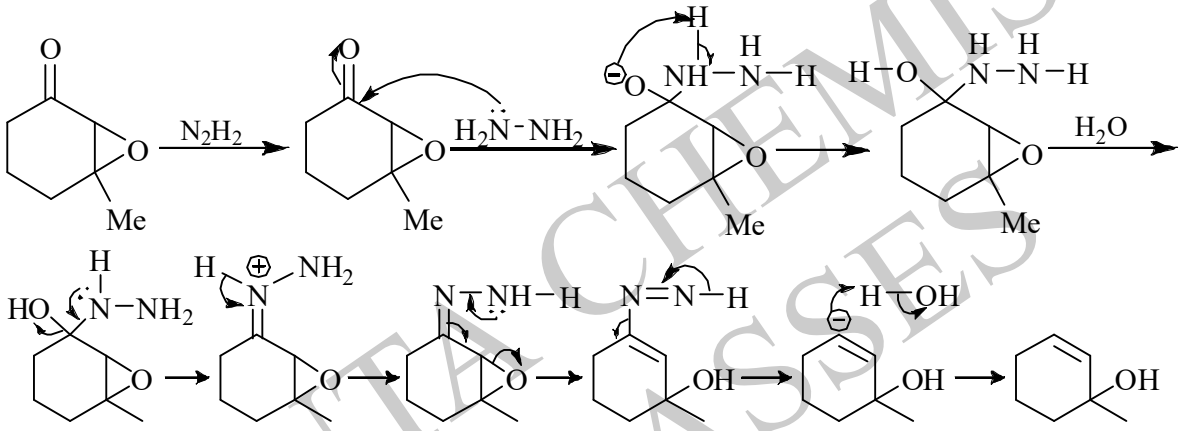
36. Since MnO_2 oxidised preferentially allylic alcohol. So,



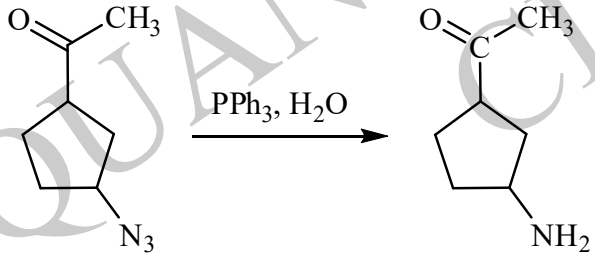
Correct option is (c)

37. 

Correct option is (b)

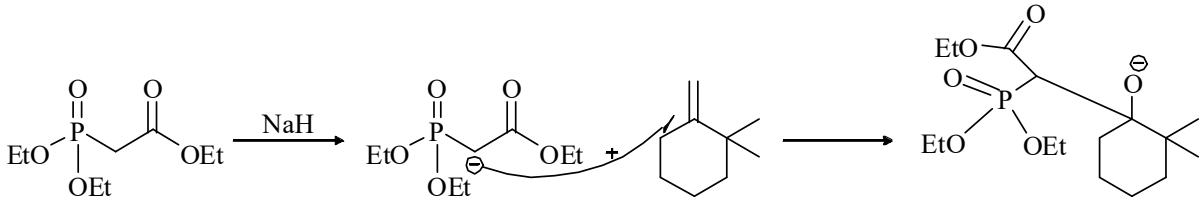
38. 

Correct option is (a)

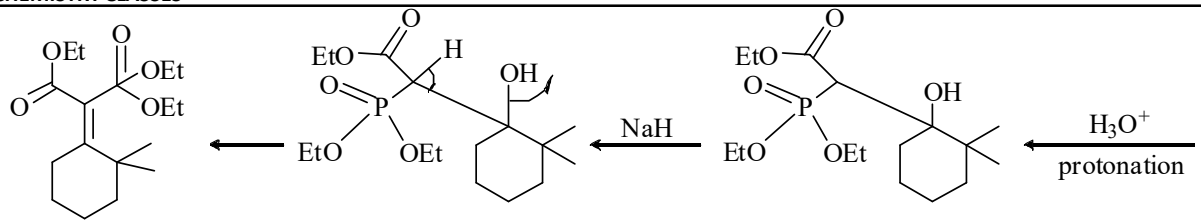
39. 

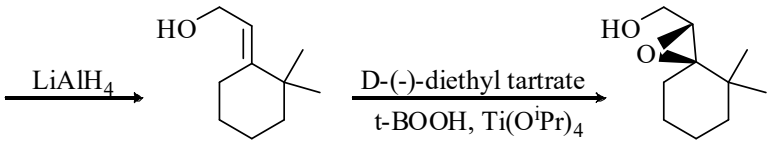
Staudinger reaction, it does not affect the other functional groups.

Correct option is (c)

40. 

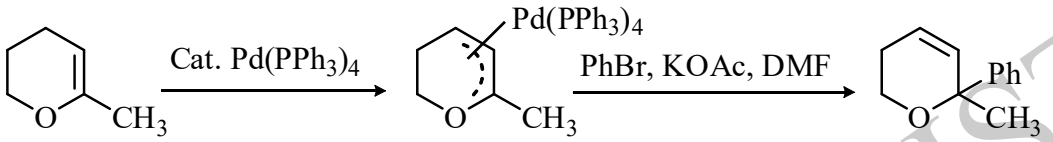
QUANTA CHEMISTRY CLASSES



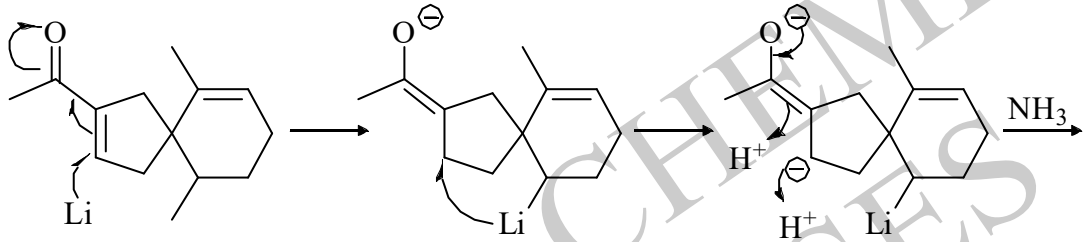


Product (S) Product (T)

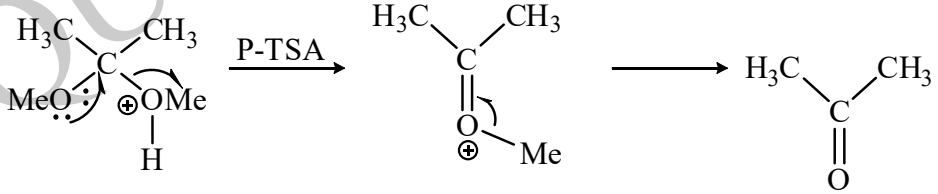
Correct option is (a)

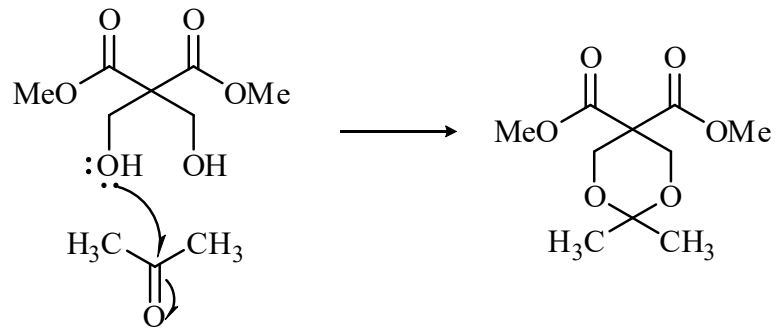
41. 

Correct option is (b)

42. 

Correct option is (a)

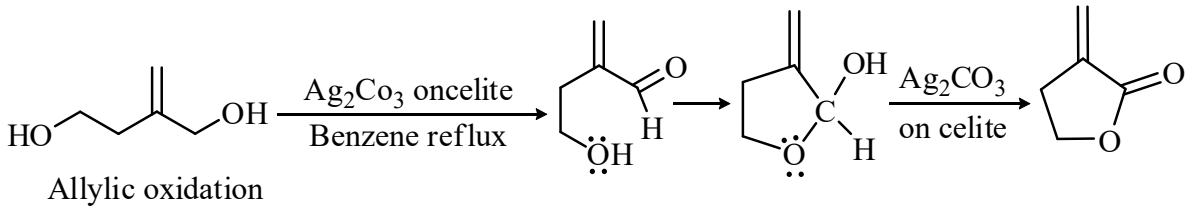
43. 



Correct option is (b)

QUANTA CHEMISTRY CLASSES

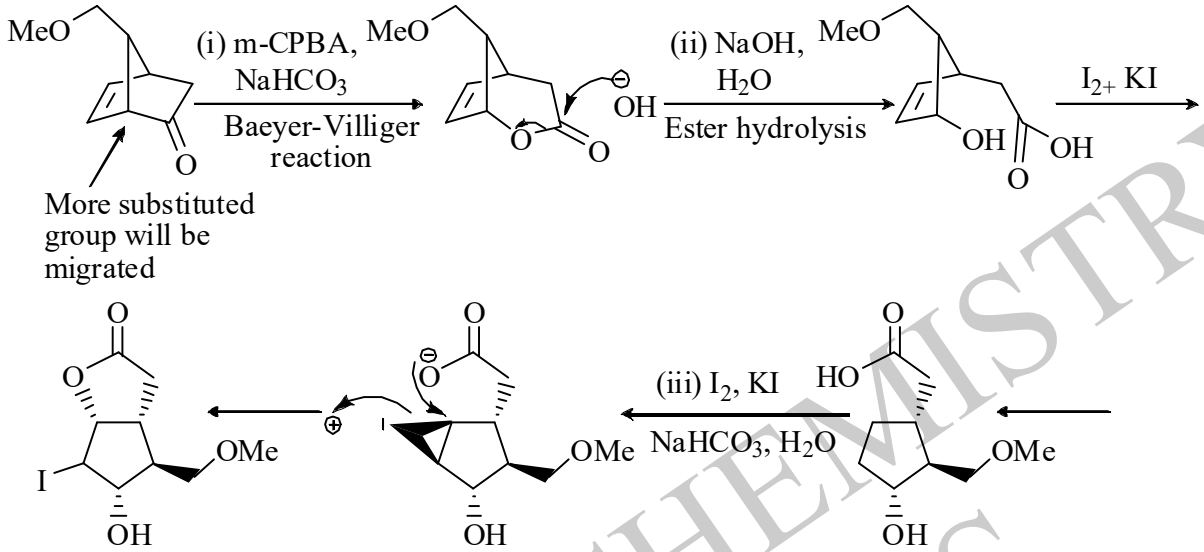
44.



Allylic oxidation

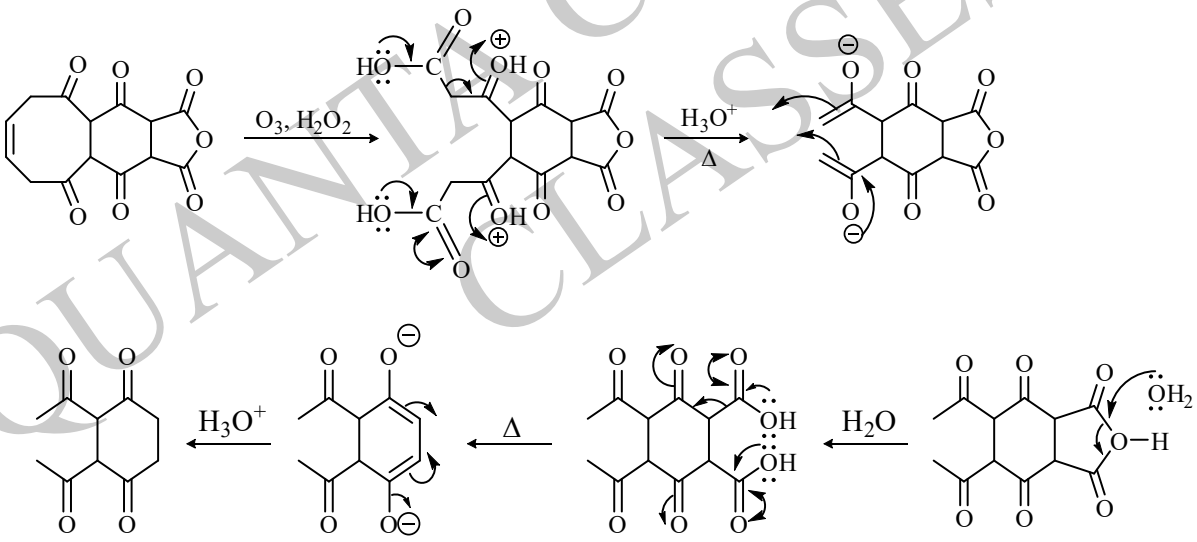
Correct option is (c)

45.



Correct option is (a)

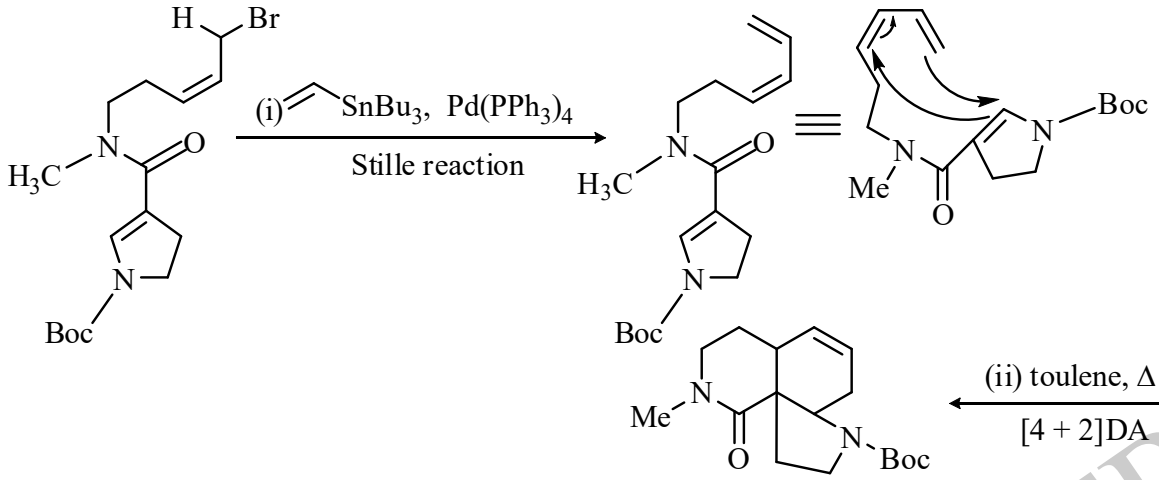
46.



Correct option is (4)

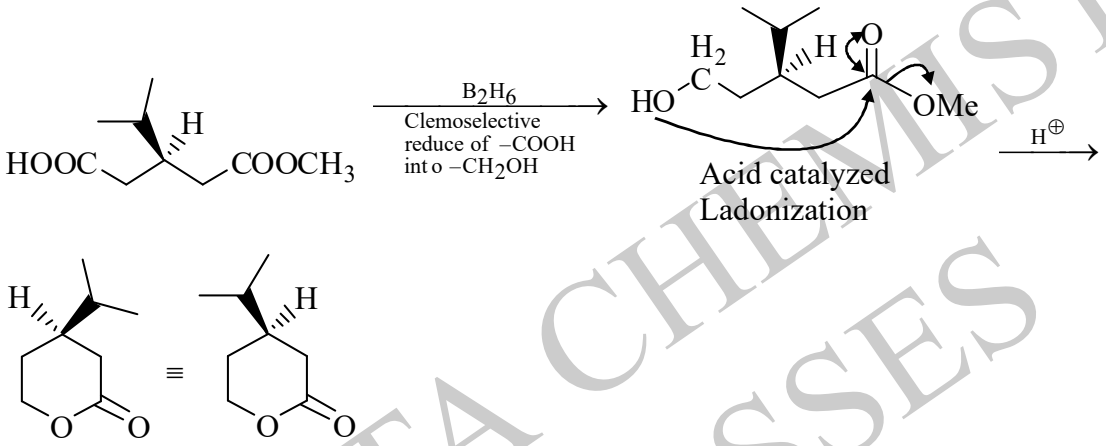
QUANTA CHEMISTRY CLASSES

47.

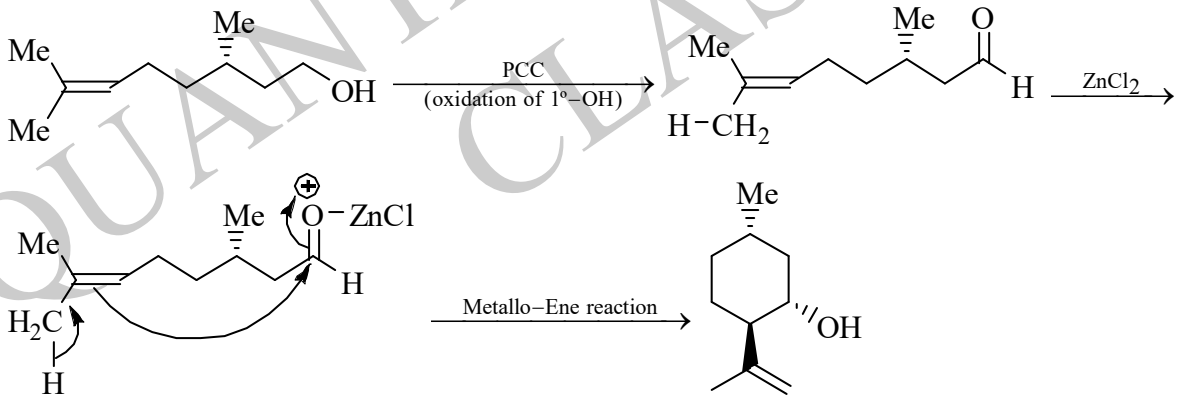


Correct option is (d)

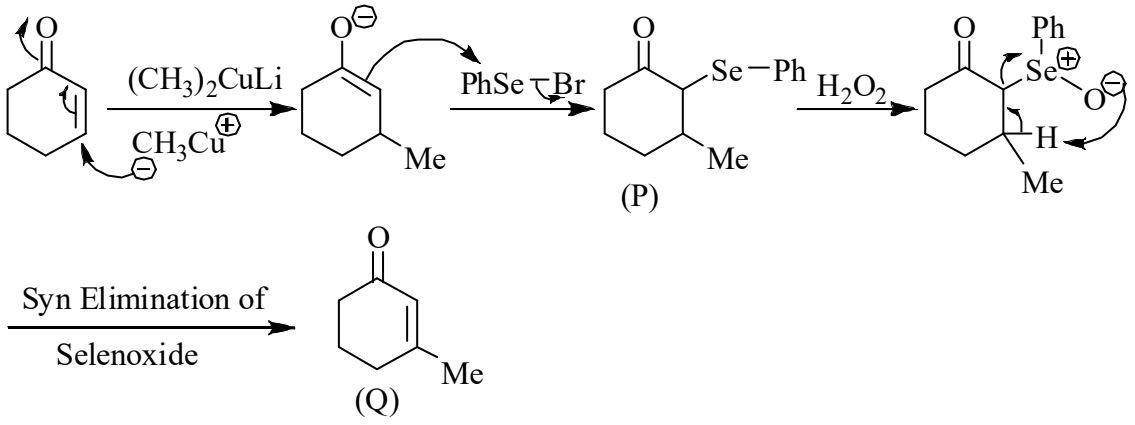
48.



49.

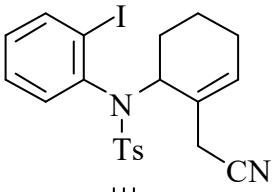


50.

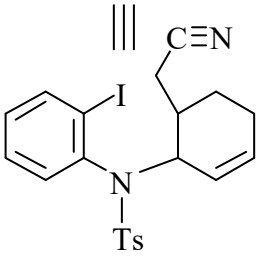


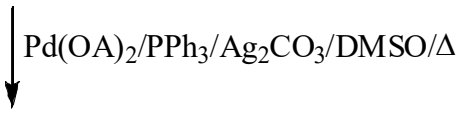
QUANTA CHEMISTRY CLASSES

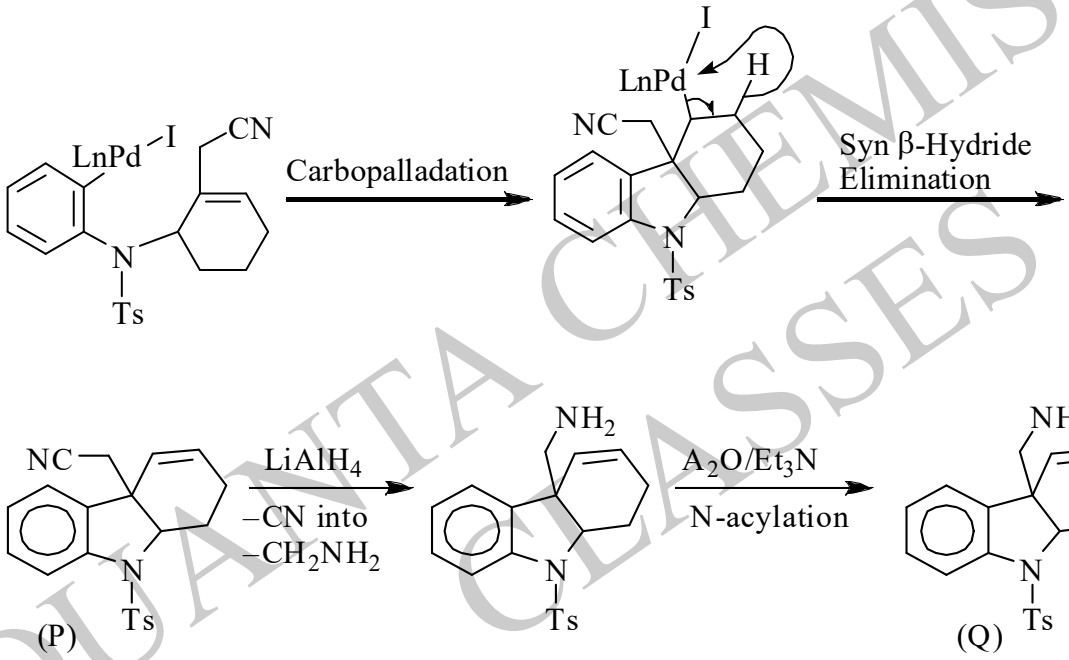
51.



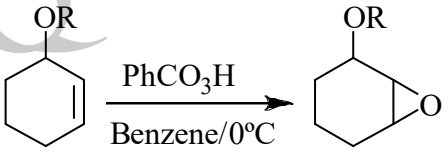
Intramoleculer Heck coupling with isomerigation of double bond



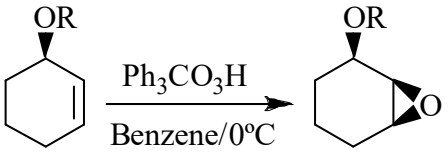




52.

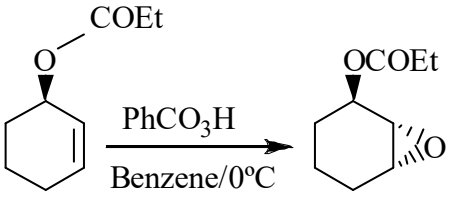


IF R = H

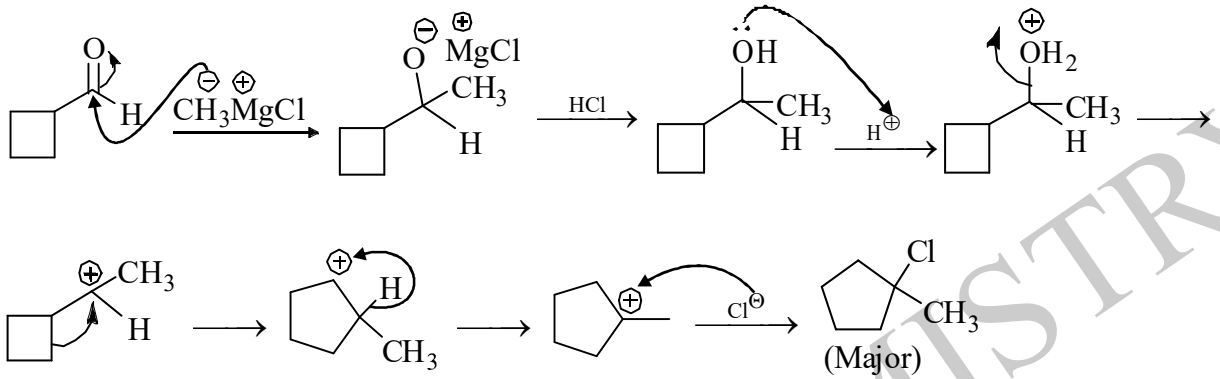


IF R = COEt

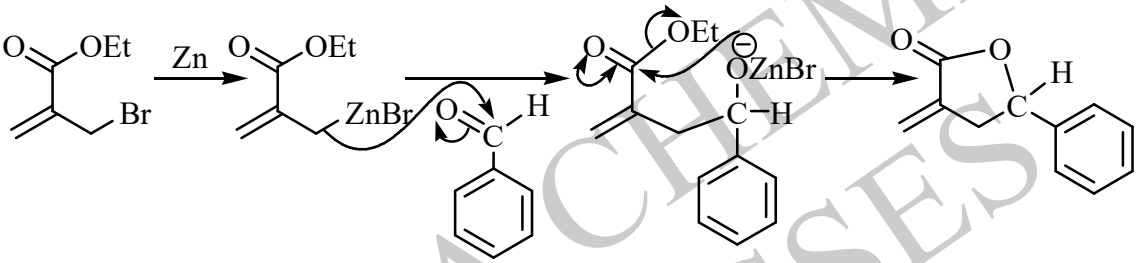
QUANTA CHEMISTRY CLASSES



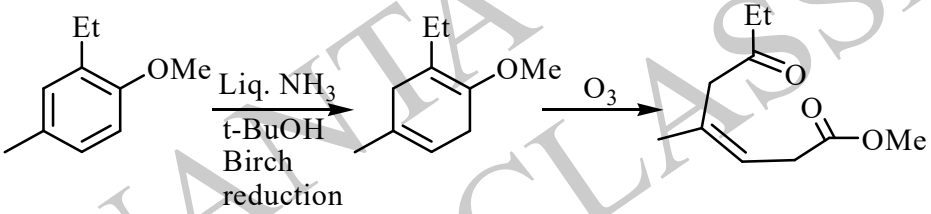
53.



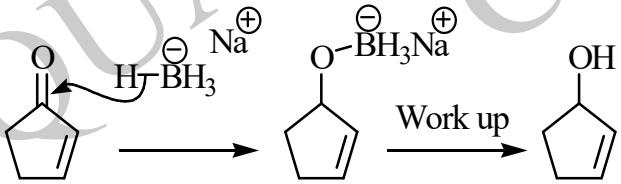
54.



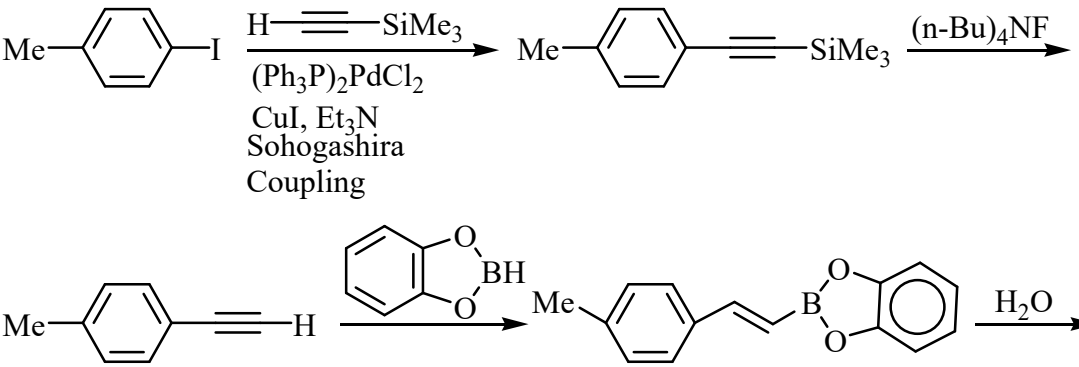
55.



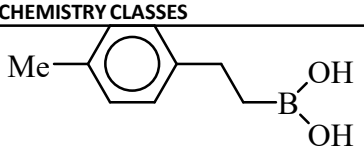
56.



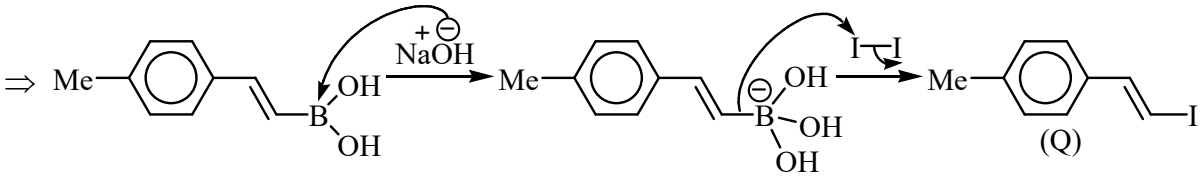
57.



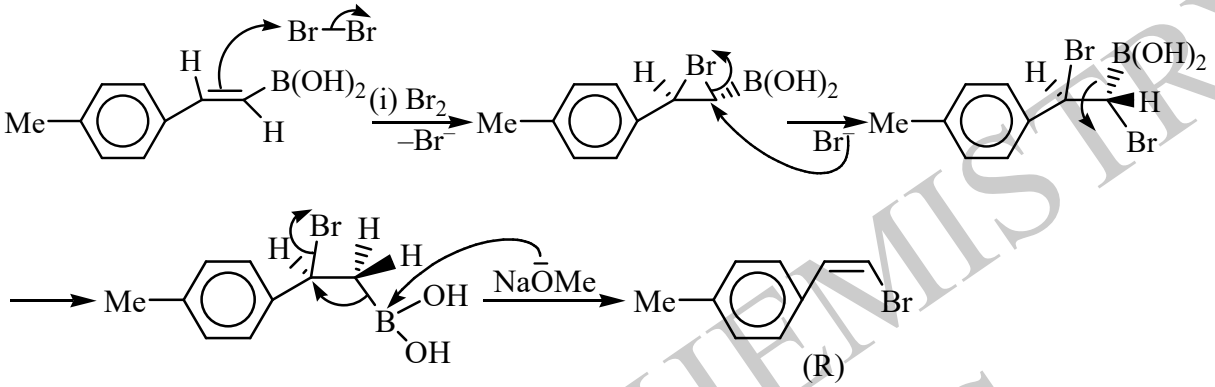
QUANTA CHEMISTRY CLASSES



(P) Major product

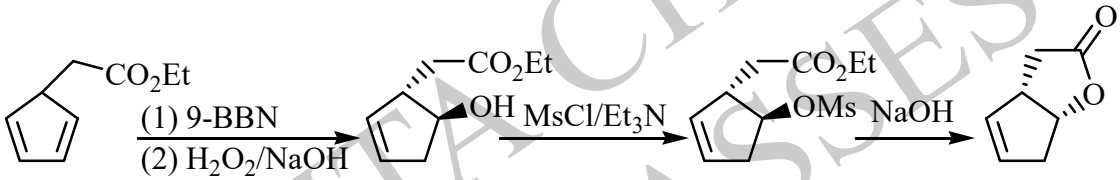


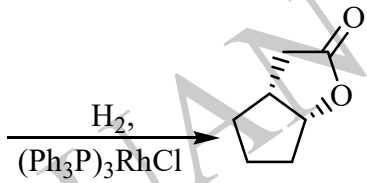
(Q)

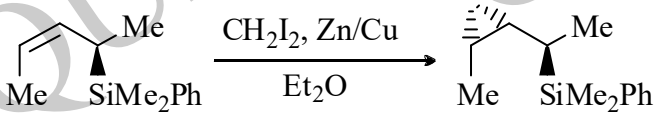


(R)

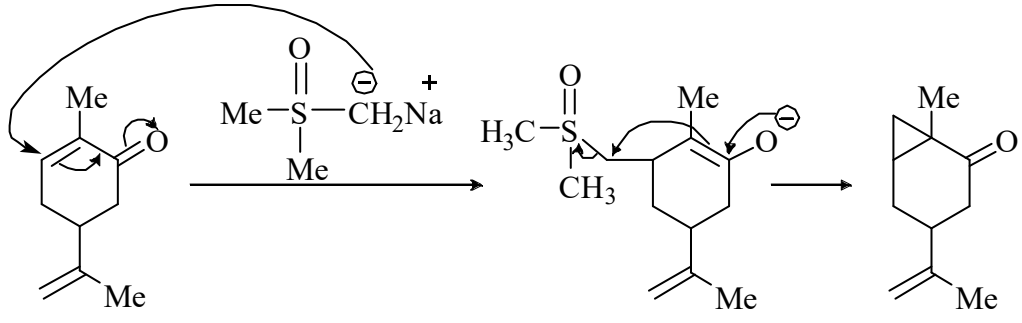
Correct option is (b)

58. 



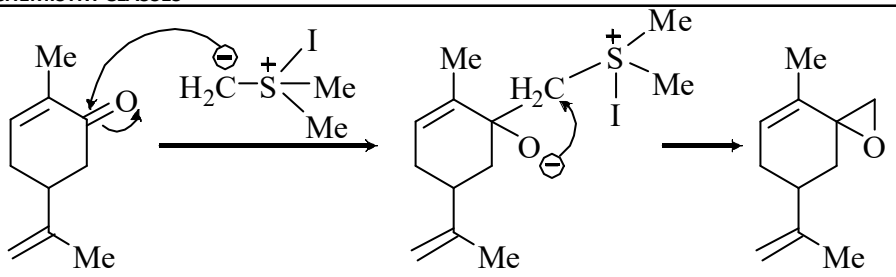
59. 

Correct option is (b)

60. 

(Q)

QUANTA CHEMISTRY CLASSES

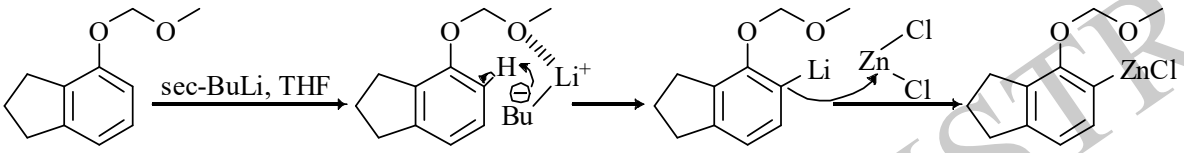


(P)

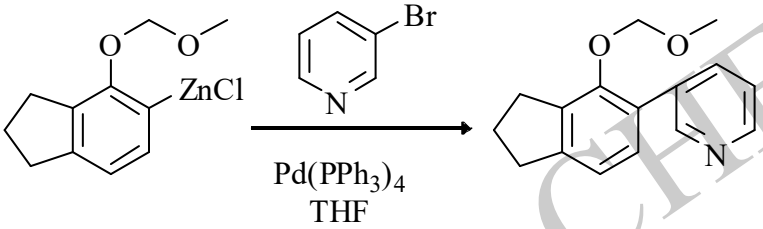
Correct option is (b)

Non → sprotecting group

61.

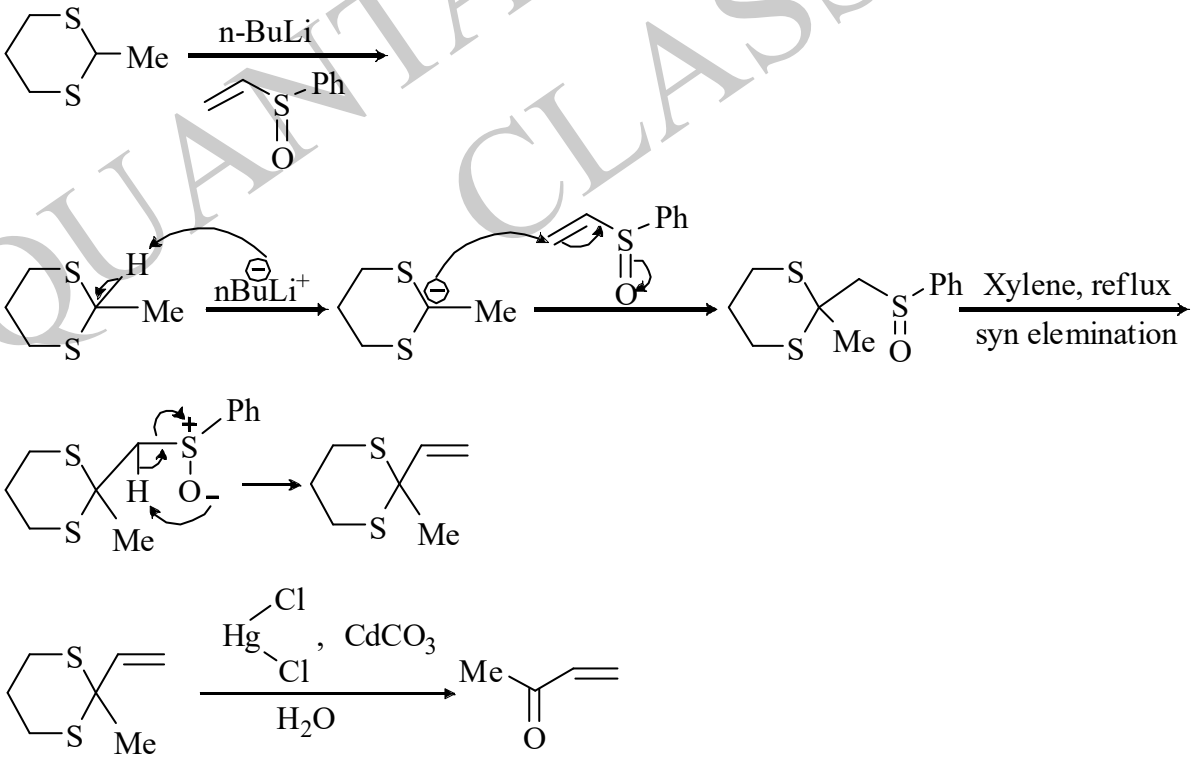


Non is strong ortho directly group



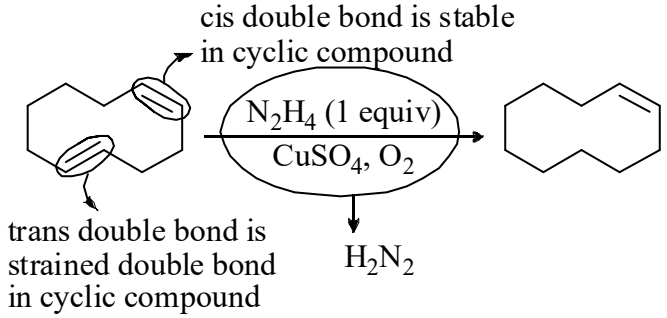
Correct option is (c)

62.

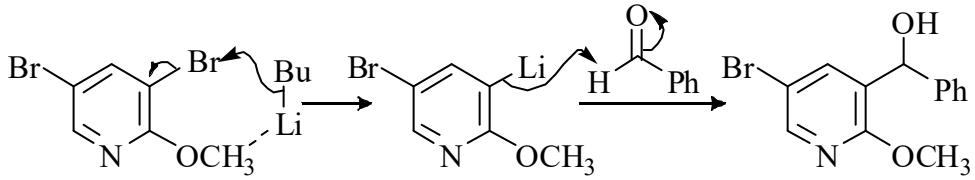


QUANTA CHEMISTRY CLASSES

63.

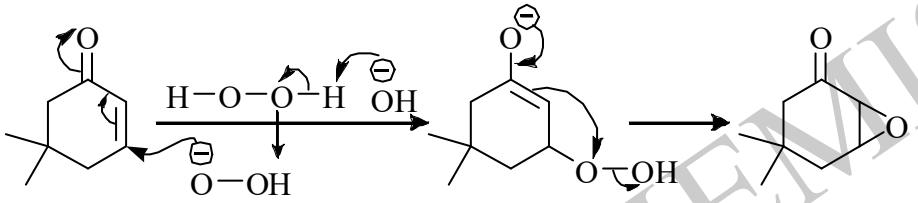

cis double bond is stable in cyclic compound
N_2H_4 (1 equiv)
$CuSO_4$, O_2
H_2N_2
trans double bond is strained double bond in cyclic compound

64.

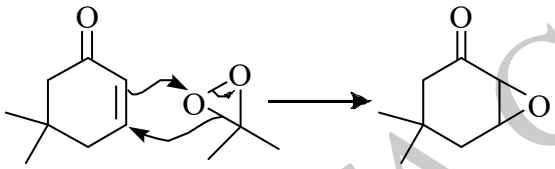


Correct option is (a)

65. (a)

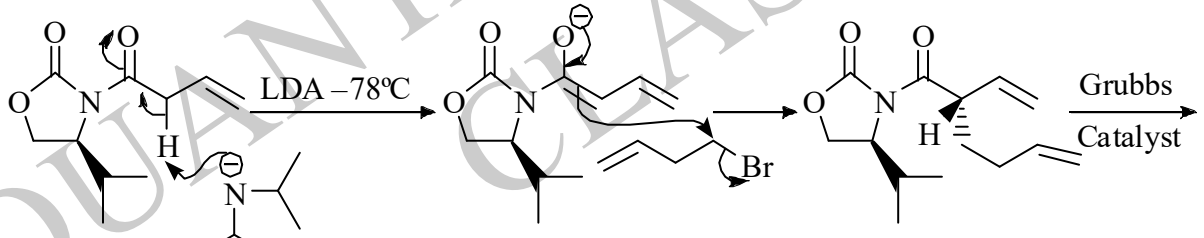


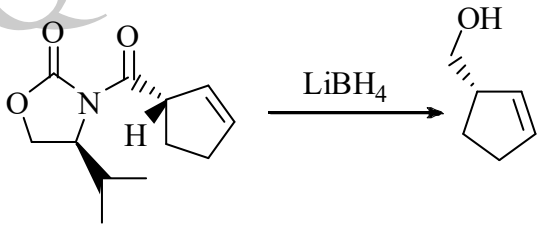
(b)



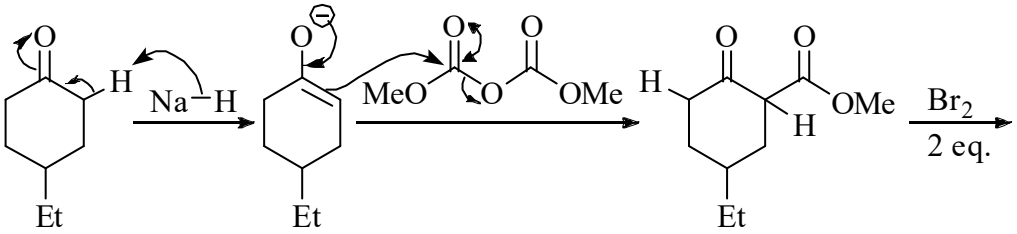
Correct options are (a and b)

66.

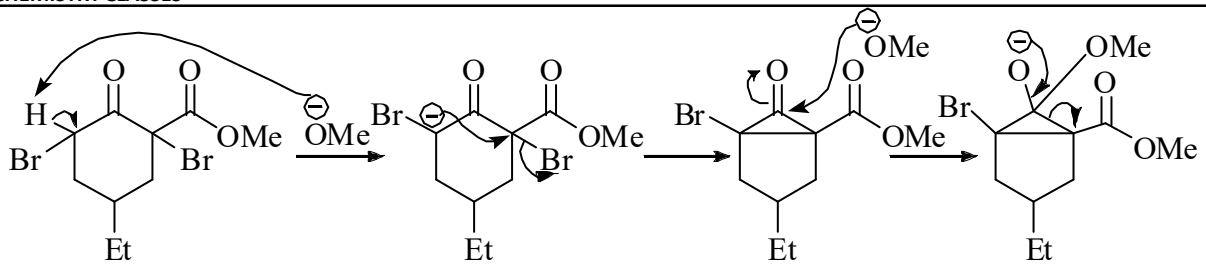


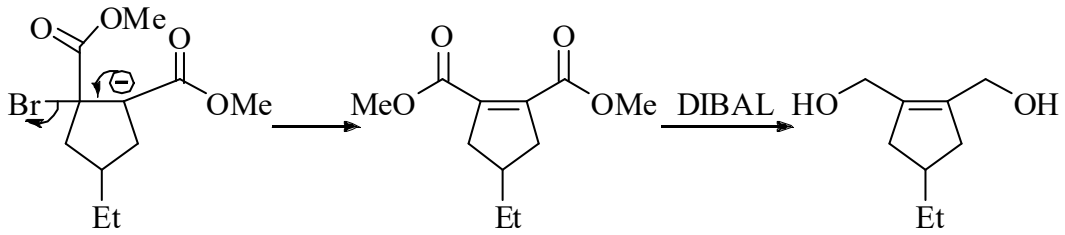


67.

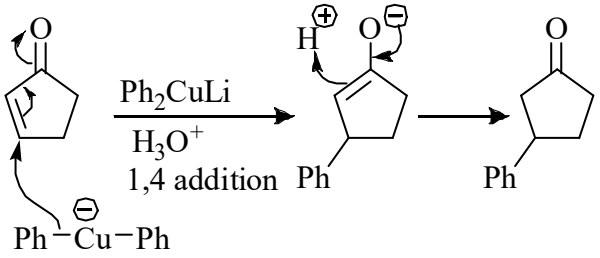


QUANTA CHEMISTRY CLASSES

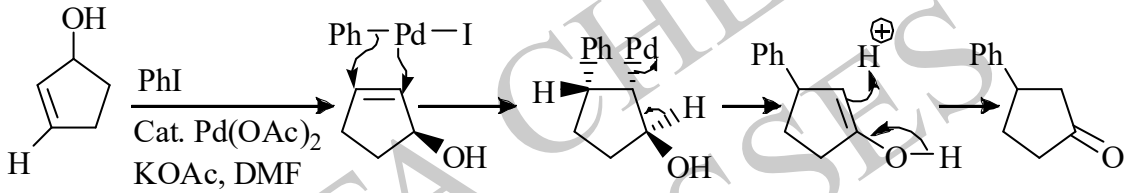




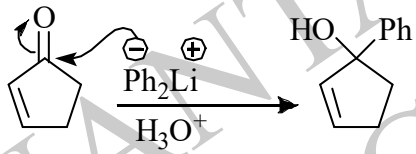
68. (a)



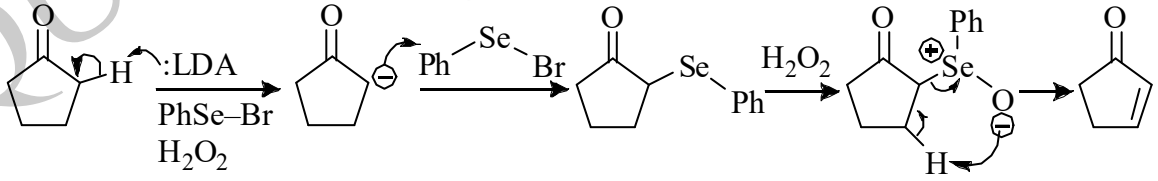
(b)



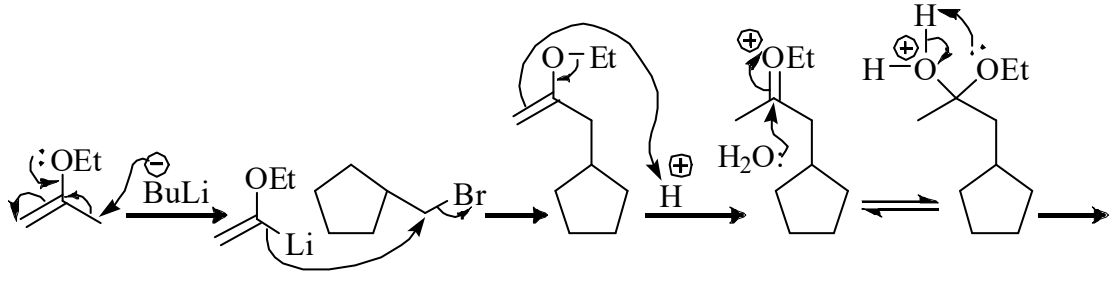
(c)



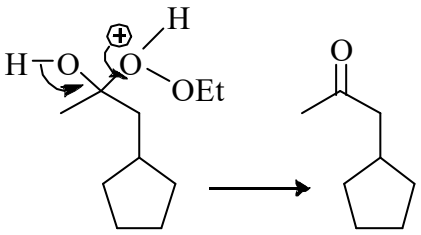
(d)



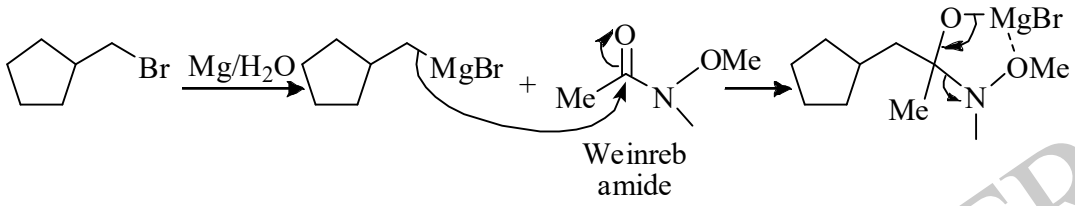
69. (a)

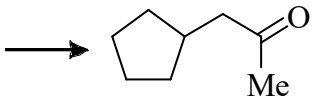


QUANTA CHEMISTRY CLASSES

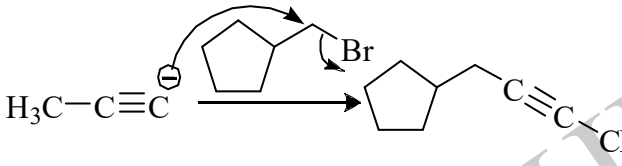


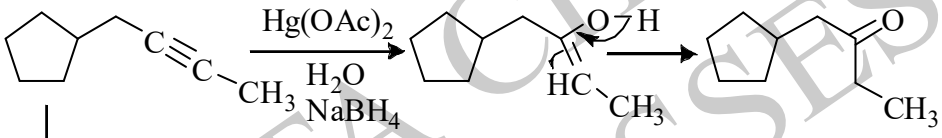
(b)

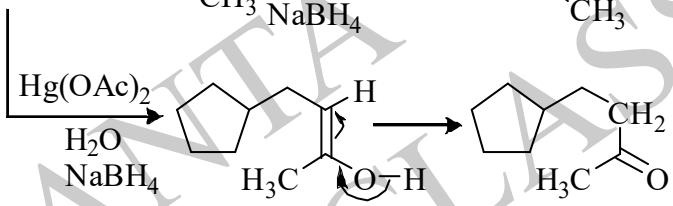




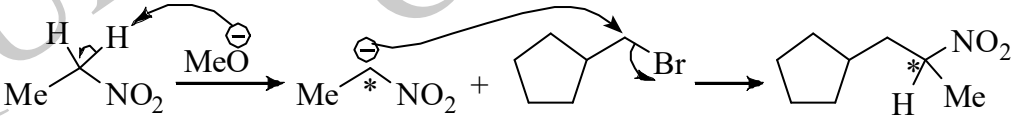
(c)

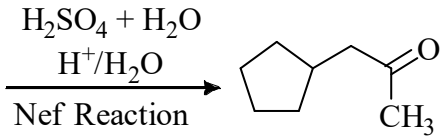






(d)





QUANTA CHEMISTRY CLASSES

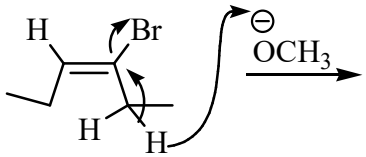
QUANTA CHEMISTRY CLASSES

4

REACTION MECHANISM -I-II

HINTS & SOLUTIONS

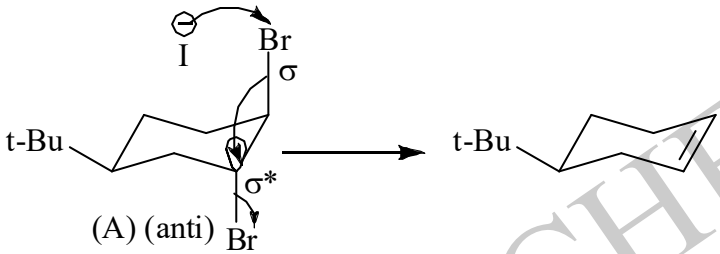
GATE 2000

1. 

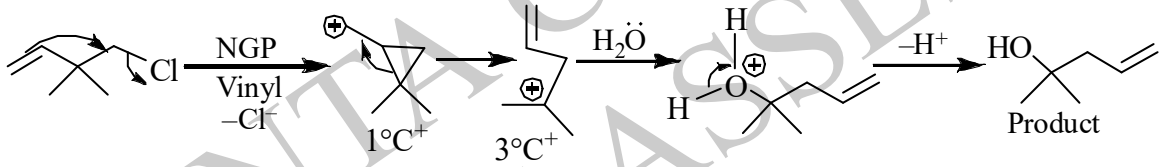
E-3-Bromohexene

Correct option is (c)

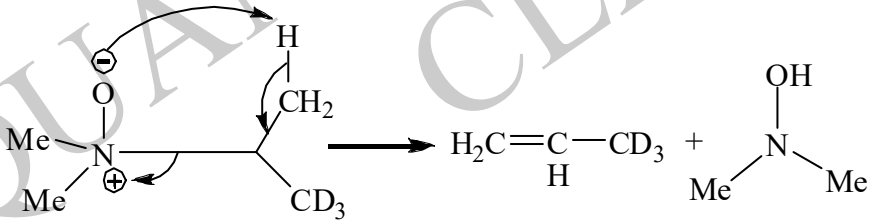
2. $KI \xrightarrow{\text{acetone}} K^+ + I^-$



This reaction is an example of didehalogination raction. It is a E_2 elimination and proceed from anti-conformation.

3. 

GATE 2001

4. 

Pyrolytic elimination

Correct option is (d)

QUANTA CHEMISTRY CLASSES

5. (I) $H_3C–CH_2 – CH_2\overset{\curvearrowright}{Cl} = H_3C–CH_2–\overset{\oplus}{C}H_2$ = 1° Carbocation with 2α–hydrogens

(II) $H_2C=C – \underset{Cl}{CH}–CH_3 = H_2C=CH–\underset{\oplus}{CH}–CH_3$ = 2° allylic Carbocation with 3α–hydrogens

(III) $H_3C – \underset{\underset{Cl}{|}}{CH}–CH – CH_3 = H_3C–CH_2–\overset{\oplus}{C}H–CH_3$ = 2° Carbocation with 5α–hydrogens

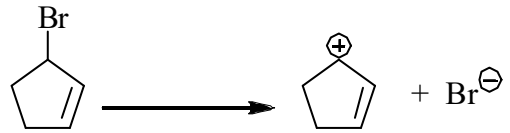
(Stability order of carbocation = II > III > I)

Decreasing order of S_N1 reactivity.

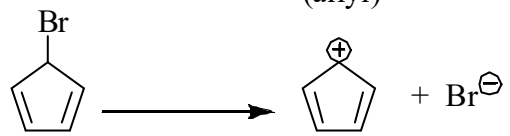
(II > III > I) Correct option is (c)

GATE 2002

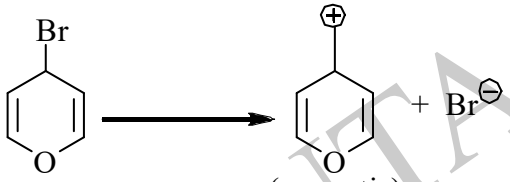
6. S_N1 reactione in the following compounds



(allyl)



(antiaromatic)



(aromatic)

Order of reactivity in SN^1 depends upon the stability of carbocation.

Stability of carbocation with reactivity n S_N1 reaction.

In Case-III-Fromation of most stable carbocation due to aromaticity

In Case-II-Carbocation destabilise due to formation of anti-aromatic cation

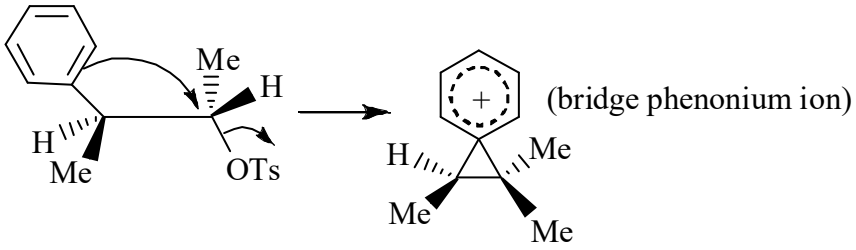
In Case-I- Carbocation stabilise by allylic carbocation

So, Correct order is III > I > II

Correct option is (c)

GATE 2003

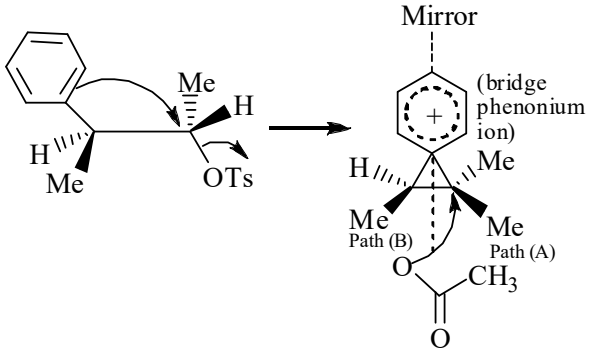
7. **Compound-I** Neighbouring group participation (NGP)



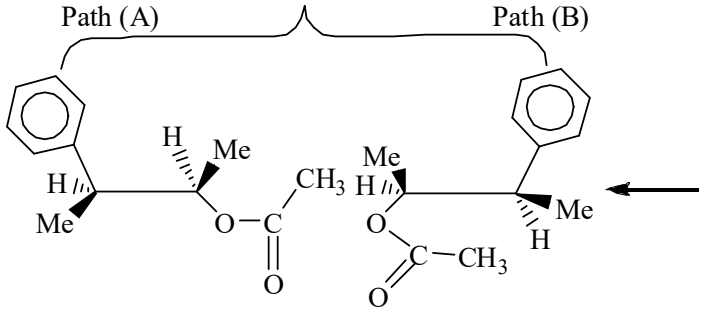
(bridge phenonium ion)

Compound -I

QUANTA CHEMISTRY CLASSES



(Achiral intermediate)



(Racemic mixture)

Reason : Wrong

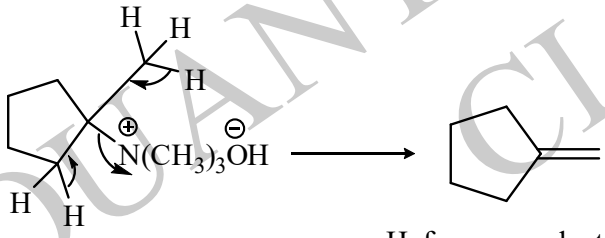
Because due to NGP of bridge phenomenum ion chiral intermediate and achiral nitermediate are formed in compound (I) and (II) respectively.

Assertion : Right

Tosylate (I) gives an acetate with retention of configuration and tosylate (II) gives a racemic mixture of acetates.

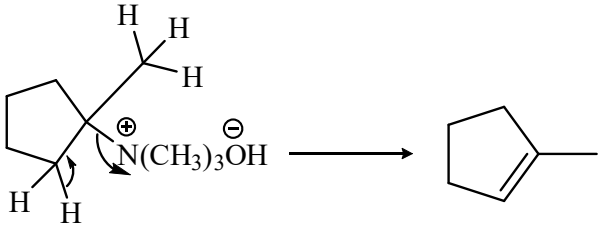
Correct option is (d)

8.



Hofmann product
(Major)

In this case E_{1cb} like mechanism, less subsituted alkene formed will be major product

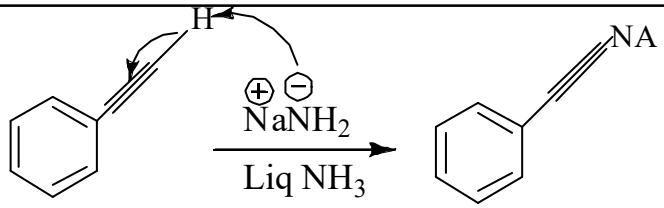


Saytzeff product
(Minor)

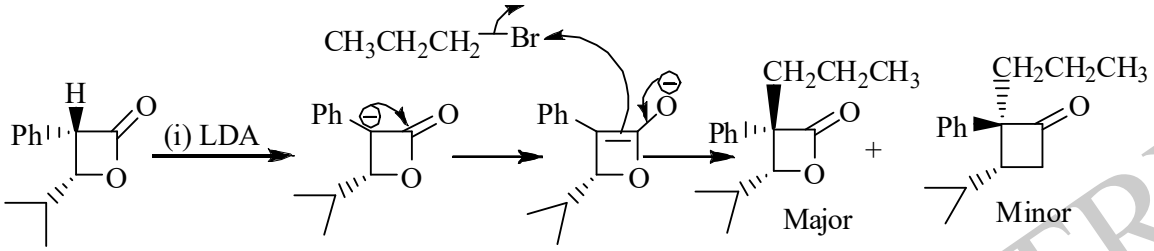
Correct option is (c)

GATE 2004

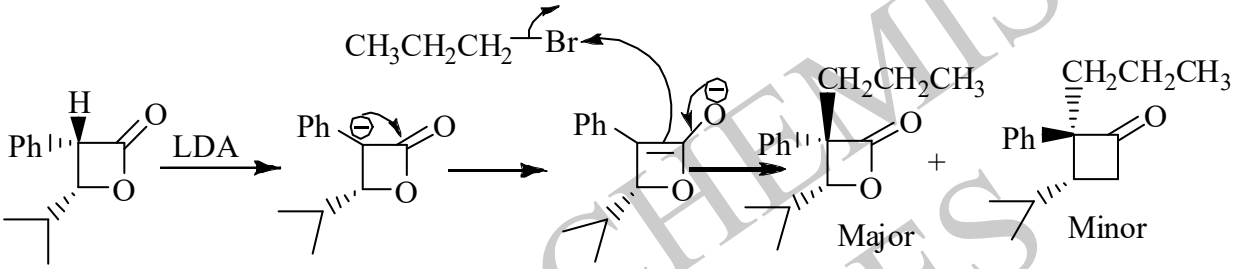
QUANTA CHEMISTRY CLASSES

9. 

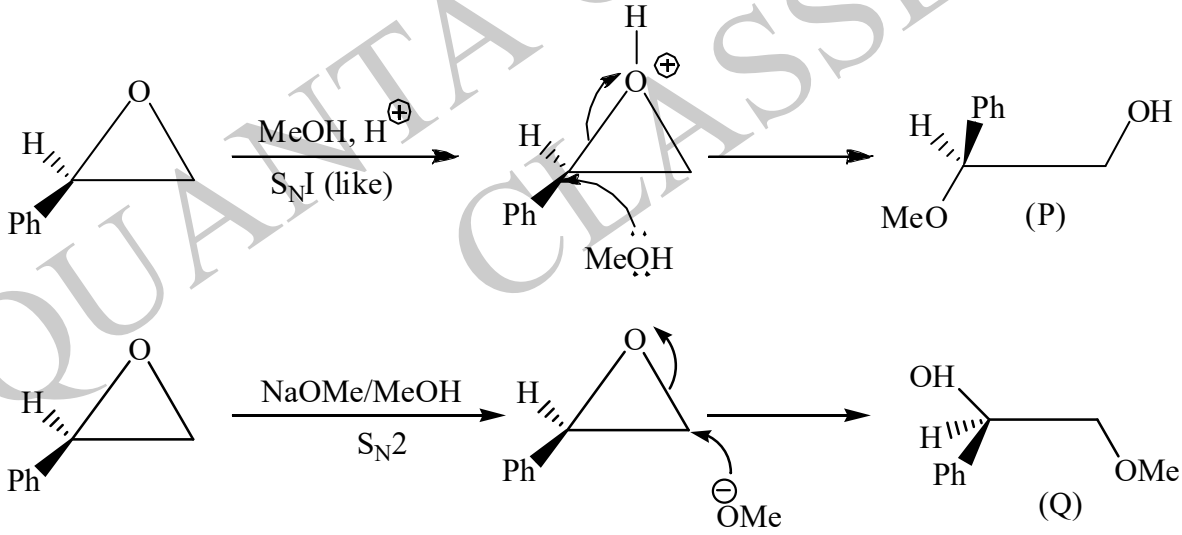
Correct option is (b)

10. (i) 

Alkylation of cyclic enolate is stereoselective an reaction taking place on he less hindered face.

(ii) 

Correct option is (a)

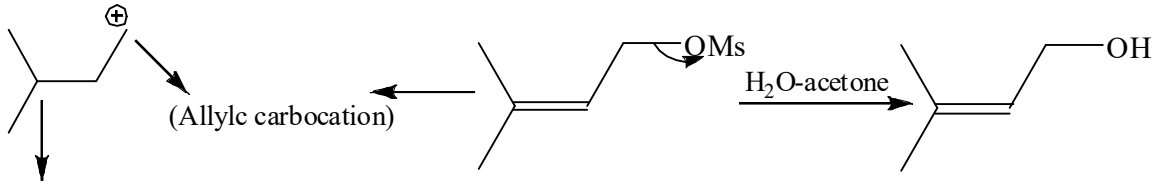
11. 

So, P and Q are optically active and positional isomers.

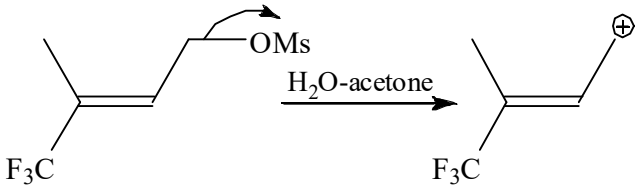
Correct option is (d)

QUANTA CHEMISTRY CLASSES

12.



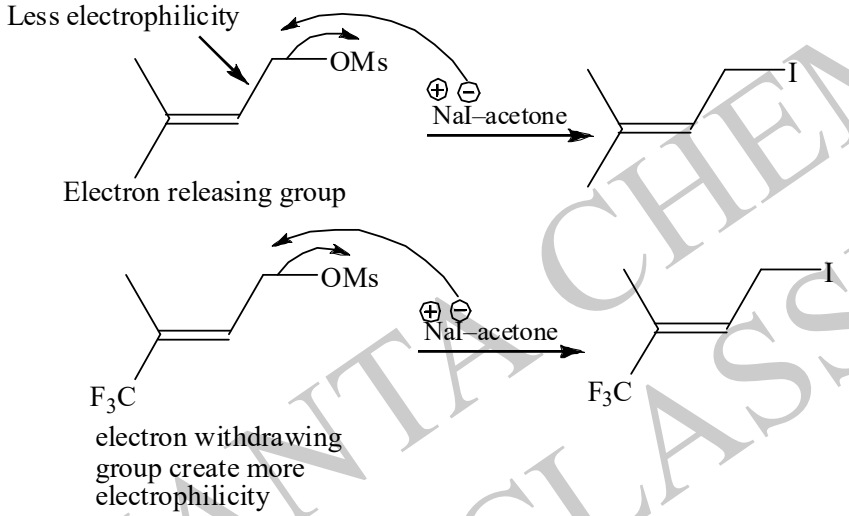
(more stable carbocation due o +I as well as hyperconjugation effect (+) H)



Stability of the carbocation decrease due to electron withdrawing group

(Above reaction proceeds through S_N1 mechanism)

Reaction-II : Reaction proceed through S_N2 mechanism



In S_N1 reaction rate of reaction depends upon stability of carbocation. So, electron releasing group stabilizes the carbocation.

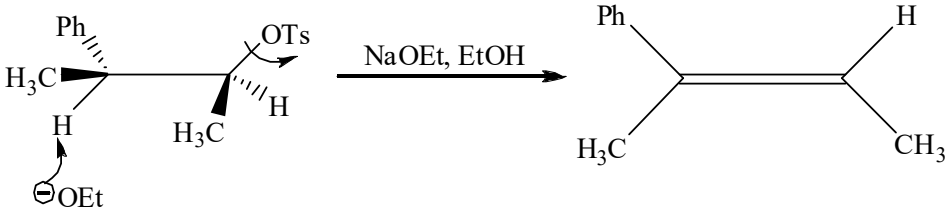
In S_N2 reaction, rate of reaction $\propto$ [reactant] [Nu^-] more electrophilic centre, fast the rate of reaction.

Electron withdrawing group increase the rate of reaction

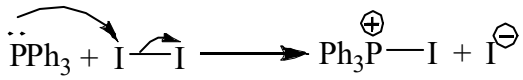
Both Reason and Assertion are correct.

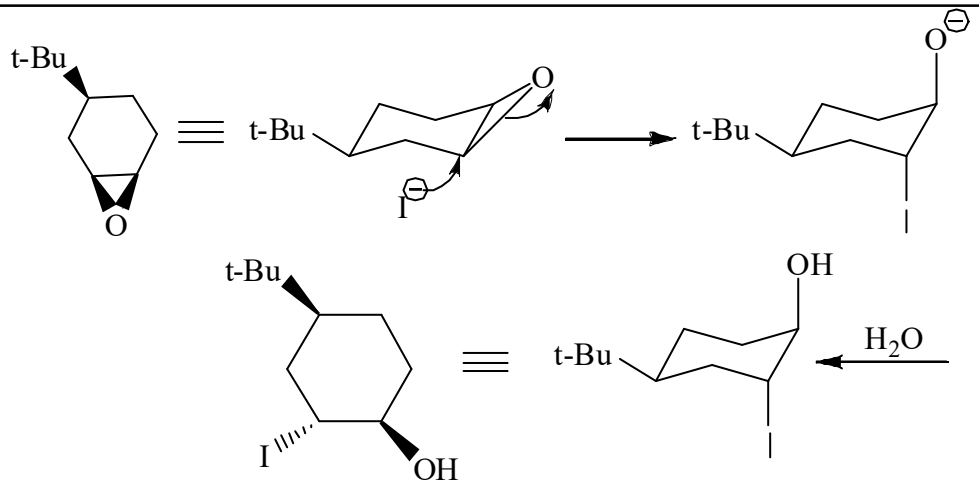
GATE 2005

13. Anti Elimination



Correct option is (d)

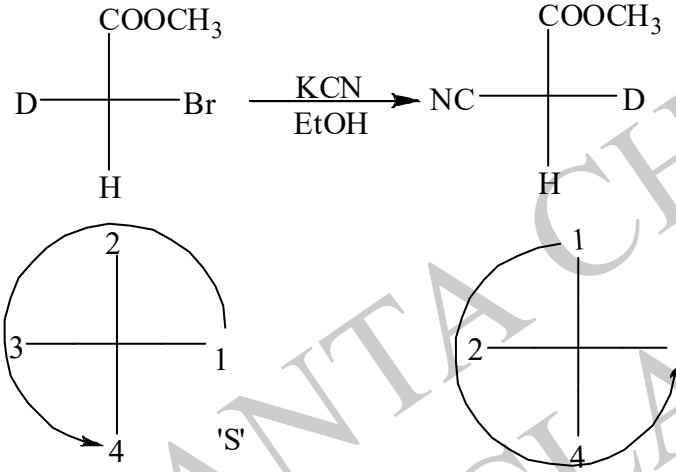
14. 



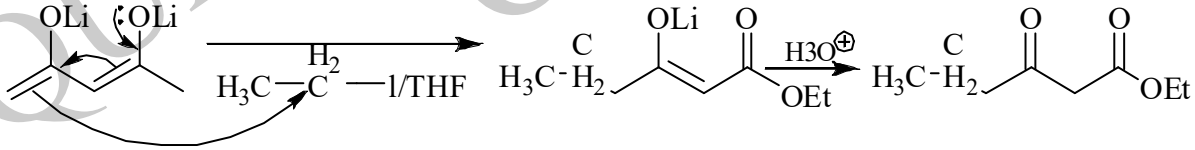
Correct option is (c)

GATE 2006

15. Above product formed through S_N2 mechanism in which (CN^-) group attack from back side. (inversion mechanism) given priority according to CIP rule.



Correct option is (d)

16. 

Correct option is (a)

GATE 2007

17. Electrophiles - Electron difficient species

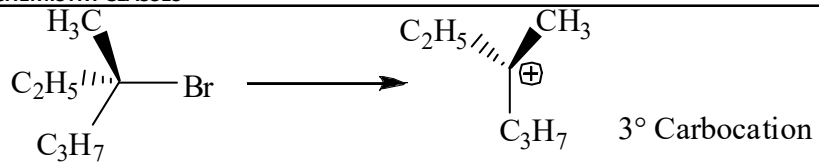
Nucleophiles- electron rich species

Electrophiles-SO_3, Cl^+, H_3O+, BH_3

Nucleophile – CH_3NH_2, $\overset{\ominus}{CN}$

Corret option is (d)

QUANTA CHEMISTRY CLASSES

18. 

3° Carbocation

Reaction proceed through S_N1 mechanism

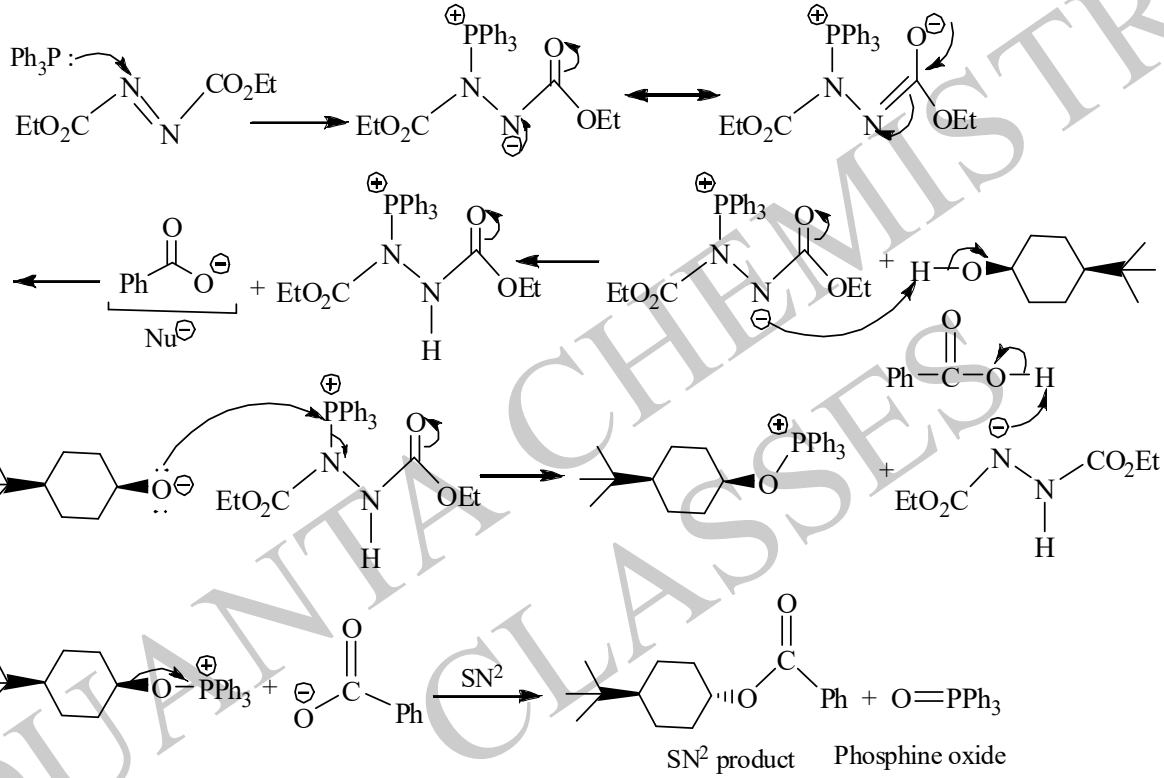
Rate α (reactant)

Rate of reaction depends upon the concentration of reactant only.

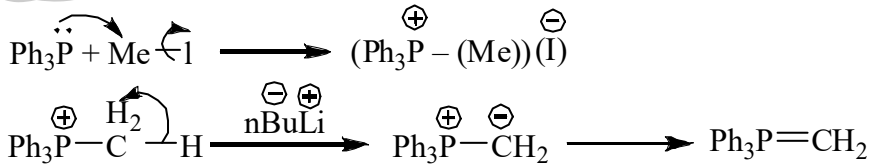
If the concentration of reactant is doubled then the rate of reaction will be double.

Correct option is (d)

GATE 2009

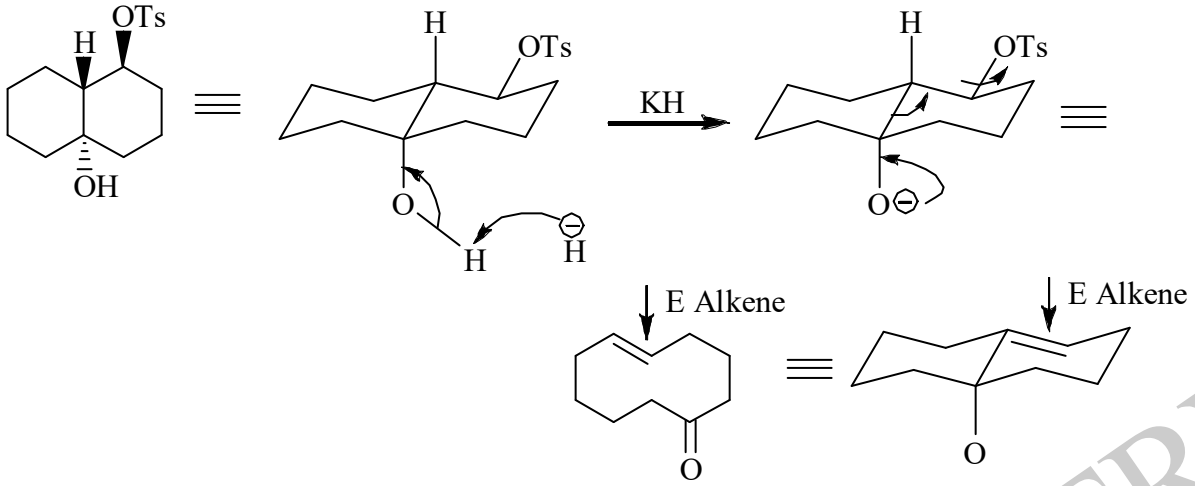
19. 

Correct option is (d)

20. 

Correct option is (b)

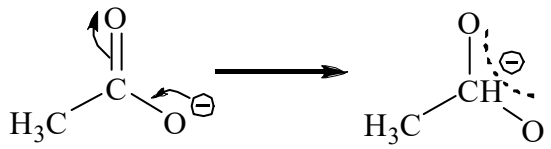
QUANTA CHEMISTRY CLASSES

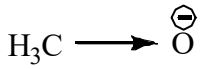
21. 

Correct option is (b)

GATE 2010

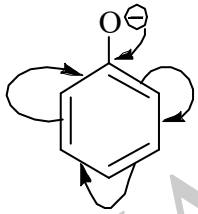
22. Nucleophilicity depends on donor ability.



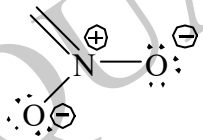


Equivalent conjugate ion

+I effect



Negative charge conjugate with phenyl ring



Negative charge stabilise with –R as well as –I effect

As the stability of negative charge increases its nucleophilic behaviour decrease.

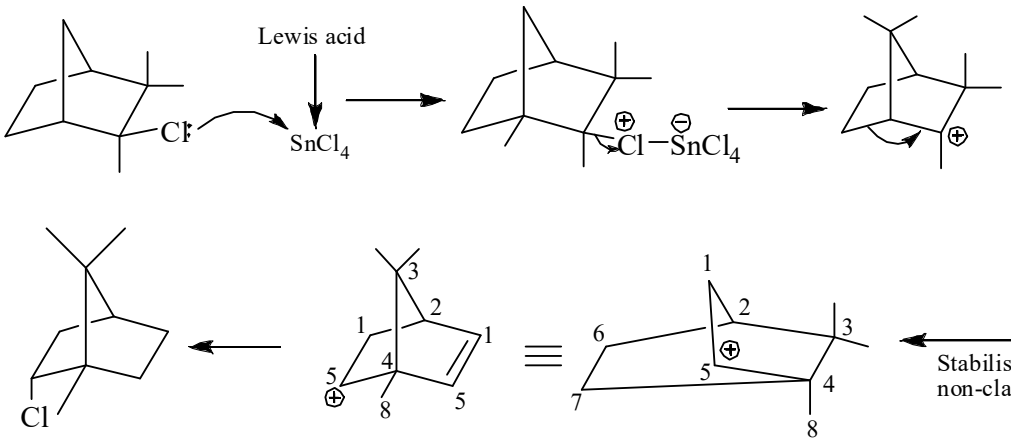
Correct order of nucleophilicity

$CH_3O^- > C_6H_5O^- > CH_3CO_2^- > NO_3^-$

Correct option is (c)

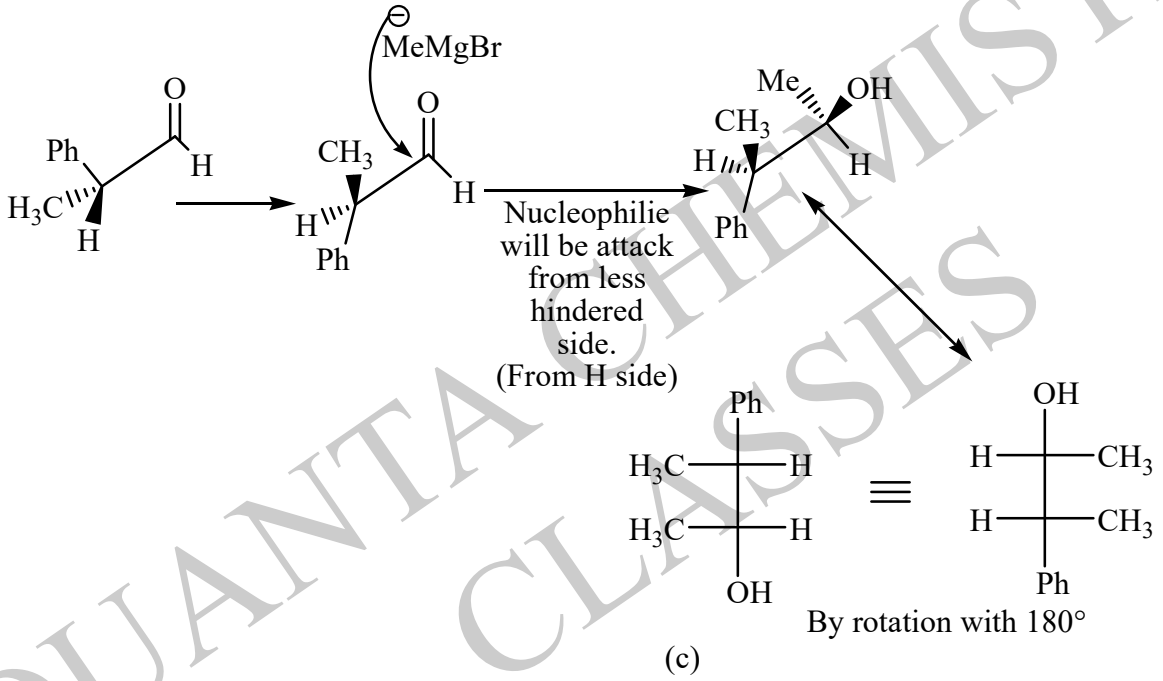
QUANTA CHEMISTRY CLASSES

23.



Correct option is (b)

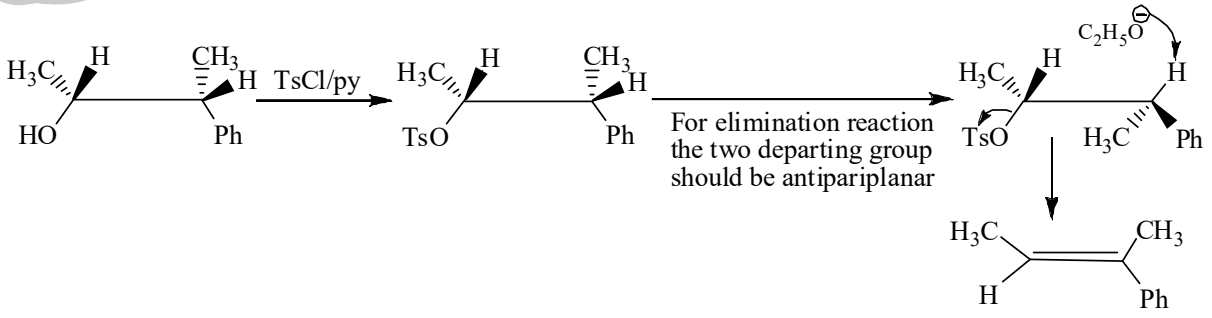
24. Cram's rule is applicable.



(c)

Correct option is (c)

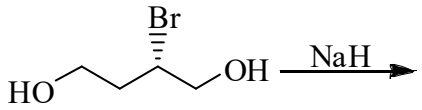
25.

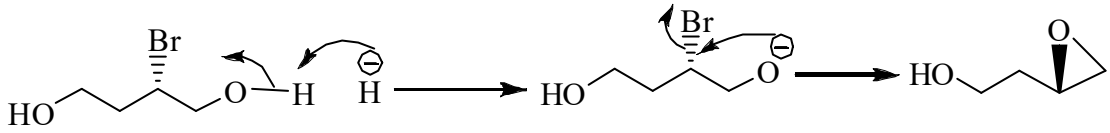


Correct option is (c)

GATE 2012

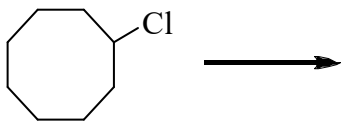
QUANTA CHEMISTRY CLASSES

26. 



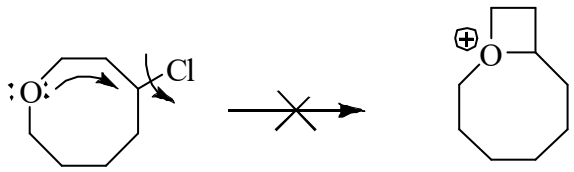
Correct option is (c)

GATE 2014

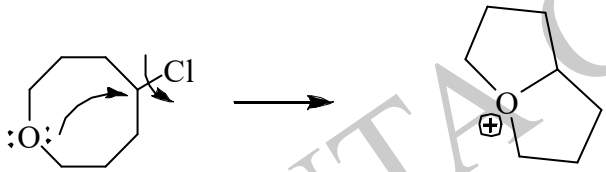
27. 

2° Carbocation

Reaction proceed through S_N1 mechanism, formation of 2° carbocation.



Reaction occurs through NGP, formation of four and Six membered ring produce formation of four membered ring in less feasible which is not stable product. Also, –I effect of O-atom destabilised the carbocation.

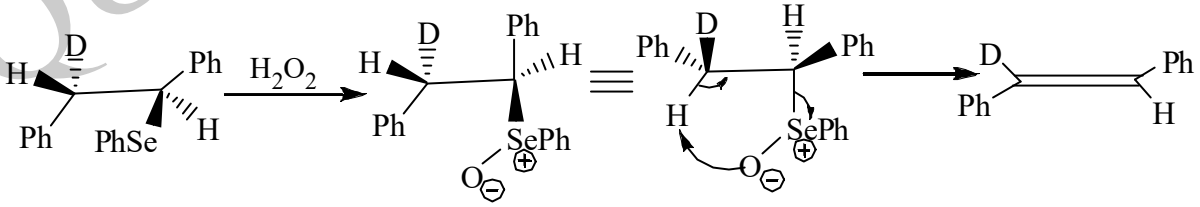


Reaction proceed through NGP formation five, five ring membered ring formation.

So correct order of solvolysis

III > II > I

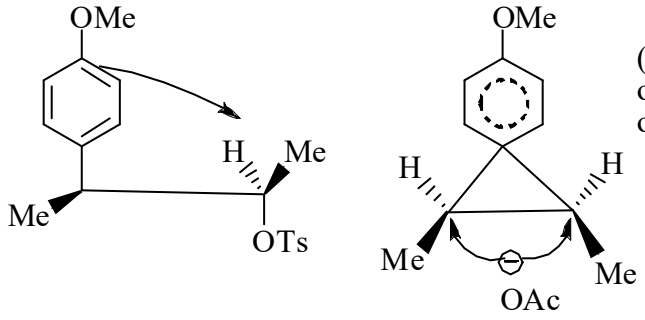
Correct option is (b)

28. 

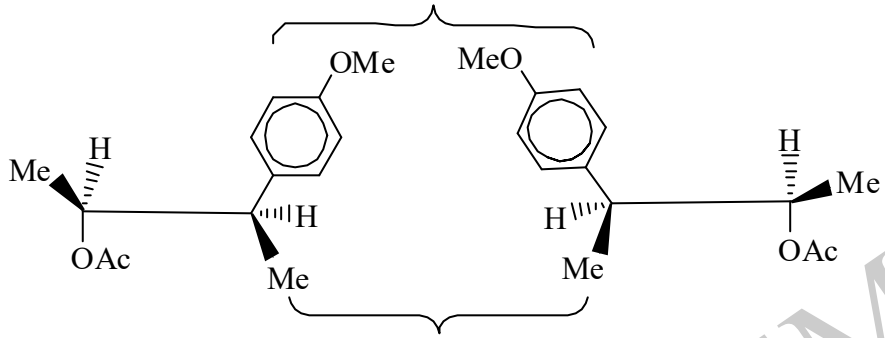
Correct option is (c)

GATE 2015

QUANTA CHEMISTRY CLASSES

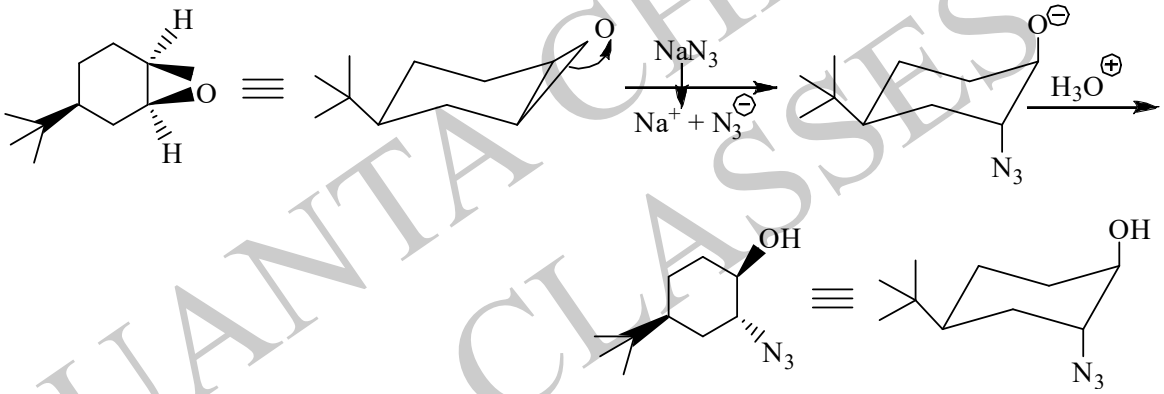
29. 

(Arenium ion intermediate)
optically inactive due to presence of plane of symmetry



Racemic mixture

Correct option is (c)

30. 

Correct option is (d)

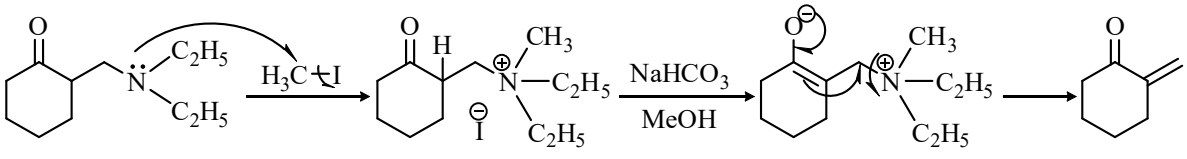
GATE 2016

31. $H-C\equiv C-\overset{H_2}{\underset{}{C}}-O-H \xrightarrow{LiNH_2/liq.NH_3} H-C\equiv C-\overset{H_2}{\underset{}{C}}-\overset{\ominus}{O}\ \overset{\oplus}{Li} \xrightarrow{LiNH_2/liq.NH_3}$

$\overset{\oplus}{Li}\ \overset{\ominus}{C}\equiv C-\overset{H_2}{\underset{}{C}}-\overset{\ominus}{O}\ \overset{\oplus}{Li} \xrightarrow[H_3O^{\oplus}]{C_2H_5-Br} C_2H_5-C\equiv C-\overset{H_2}{\underset{}{C}}-OH$

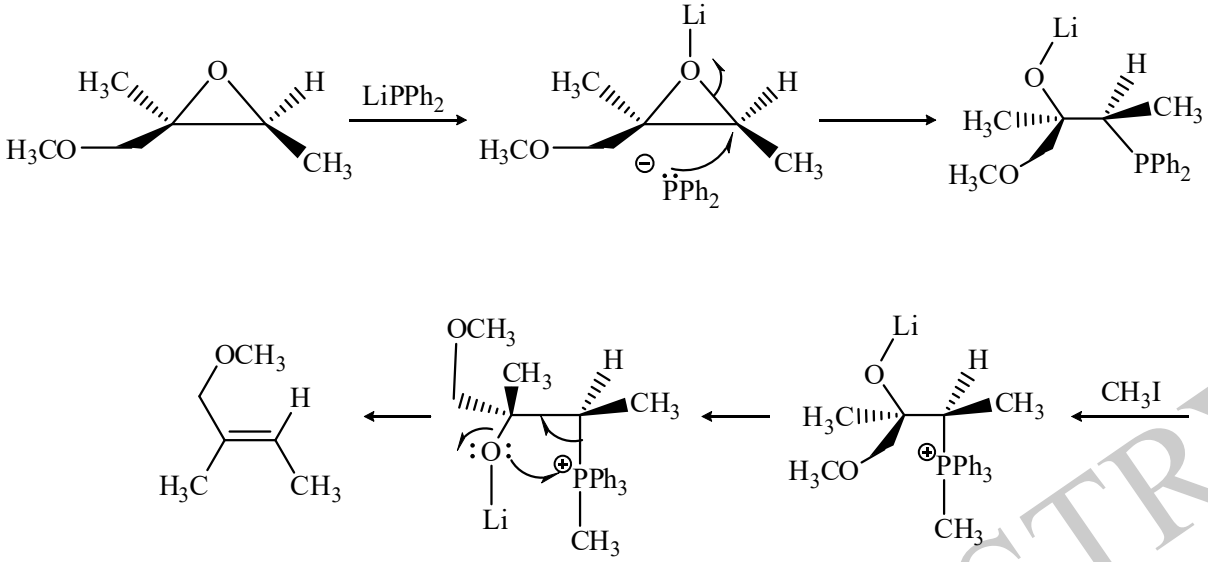
[$\overset{\ominus}{C}$ is more nucleophilic then $\overset{\ominus}{O}$]

Correct option is (a)

32. 

Correct option is (c)

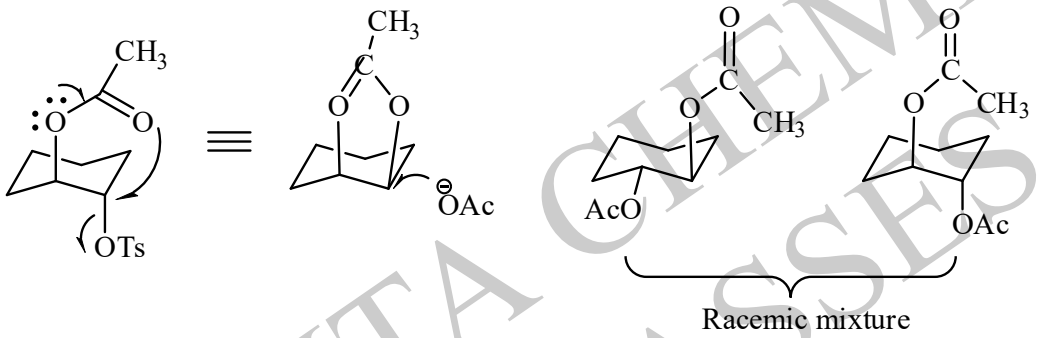
33.



Correct option is (a)

GATE 2017

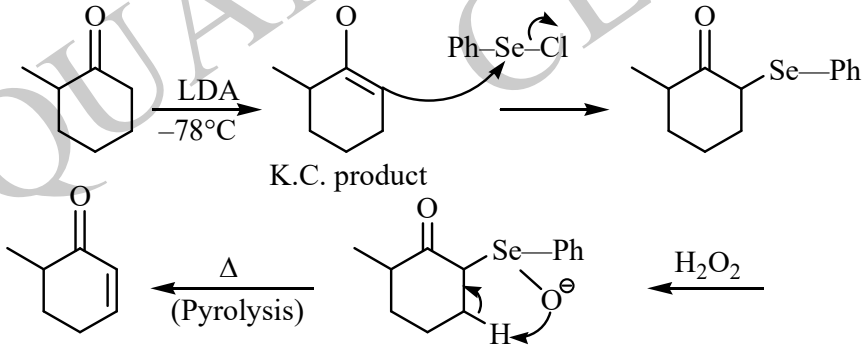
34.



Correct option is (a)

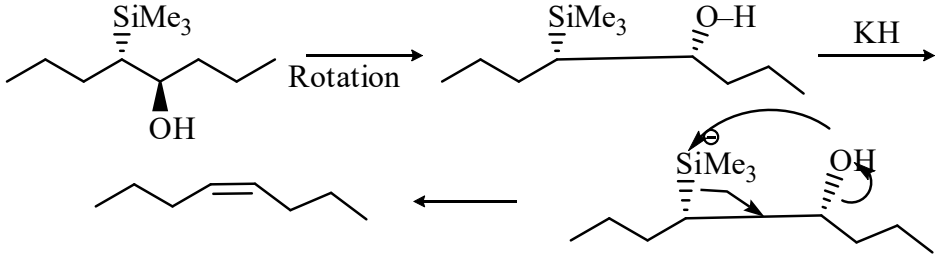
GATE 2018

35.



Correct option is (b)

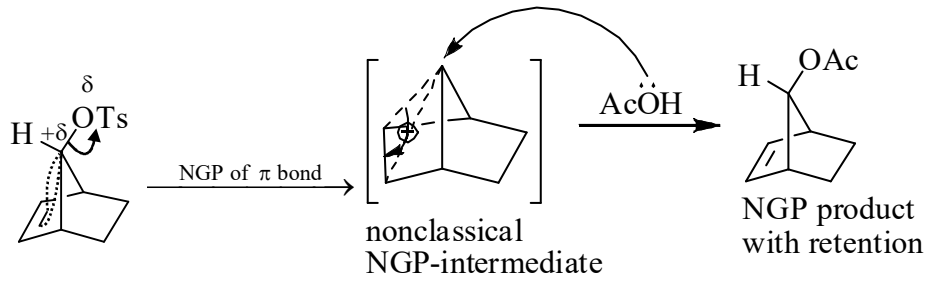
36.



Correct option is (b)

QUANTA CHEMISTRY CLASSES

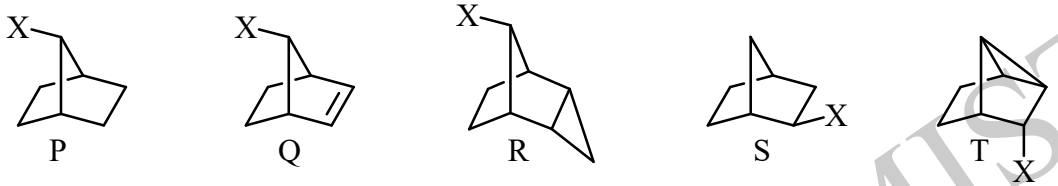
GATE 2019

37. 

Correct option is (b)

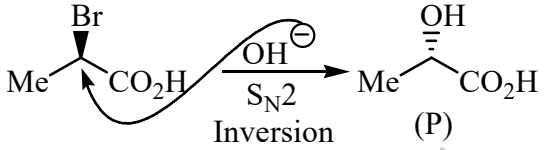
GATE 2020

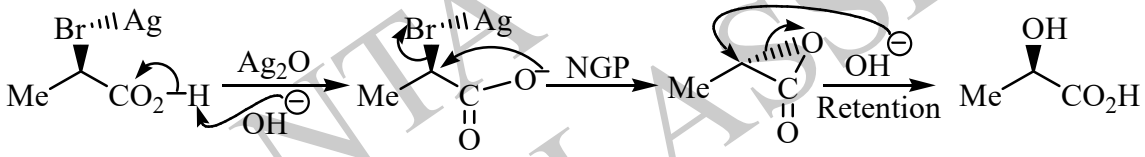
38. Rate of solvolysis is:



So, rate of solvolysis is T > R > Q > S > P

Correct answer is (c)

39. 



Correct option is (a)

QUANTA CHEMISTRY CLASSES

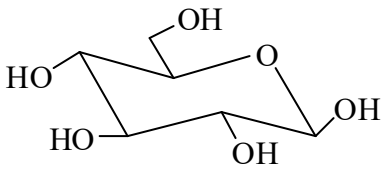
QUANTA CHEMISTRY CLASSES

5

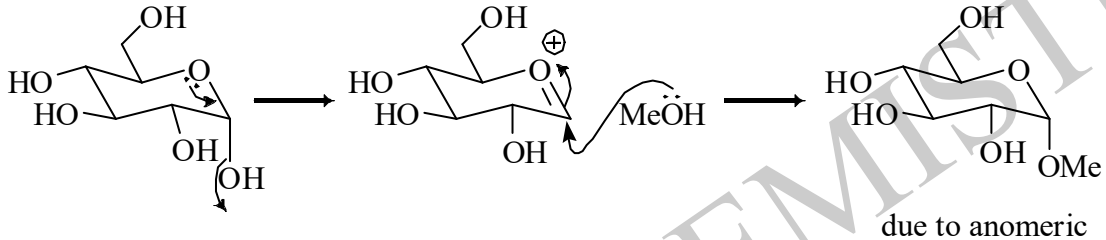
NATURAL PRODUCTS & BIOMOLECULES

HINTS & SOLUTIONS

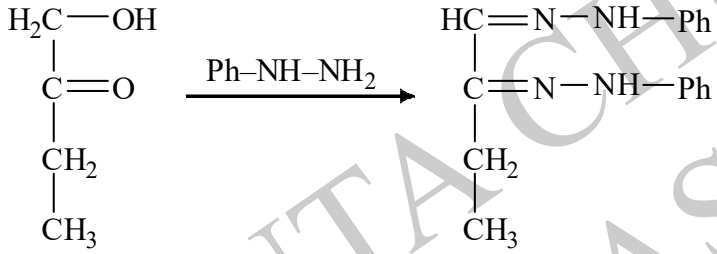
1. β-D-Glucose



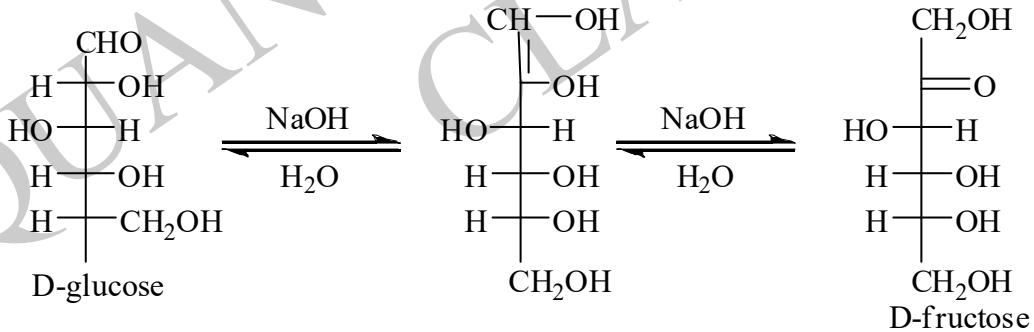
Correct option is (a)

2. 

due to anomeric effect

3. 

Correct option is (a)

4. 

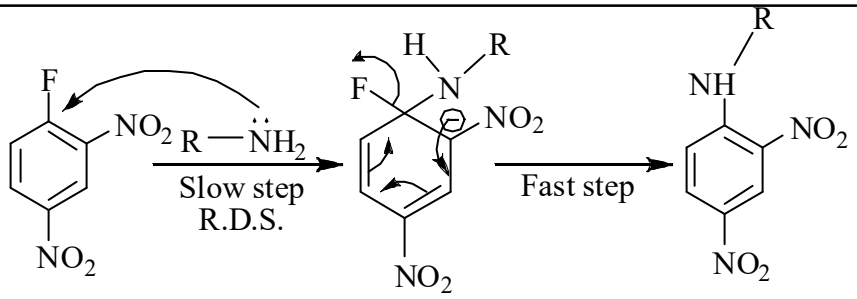
D-glucose D-fructose

5. Amino acids re natural monomers that polymeries ribosomes to form proteins

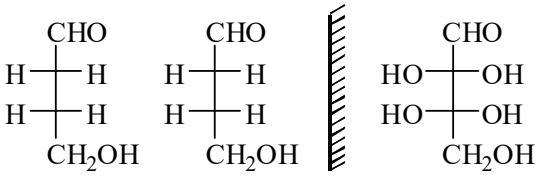
Correct option is (b)

6. This reaction is an example of nucleophilic substitution and proceeds through addition eliminaton mechanism.

QUANTA CHEMISTRY CLASSES



7. (I) I and II are distereomers because they are not mirror image to each other.



II an III are enantiomers

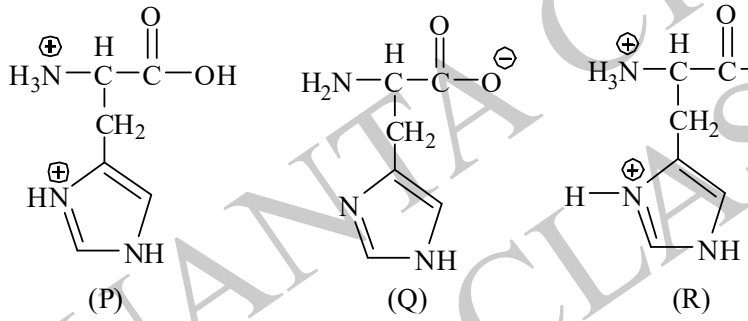
(II) I and III are interconverted by a base catelysed isomerisation.

(III) Hydroxyl group present at first chiral carbon from bottom side, right side known as D-sugar. If lef side (OH group) known as L-sugar

So I and III are D-sugar and II and IV are L-sugar.

Correct option is (b)

8.



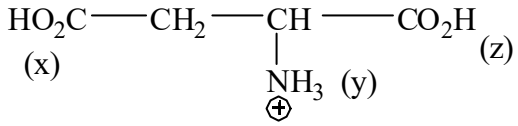
pH = 1
Acidic pH overall positive charge

pH = 12
Basic pH overall negative charge

pH = 7
Neural pH

Correct option is (a)

9.



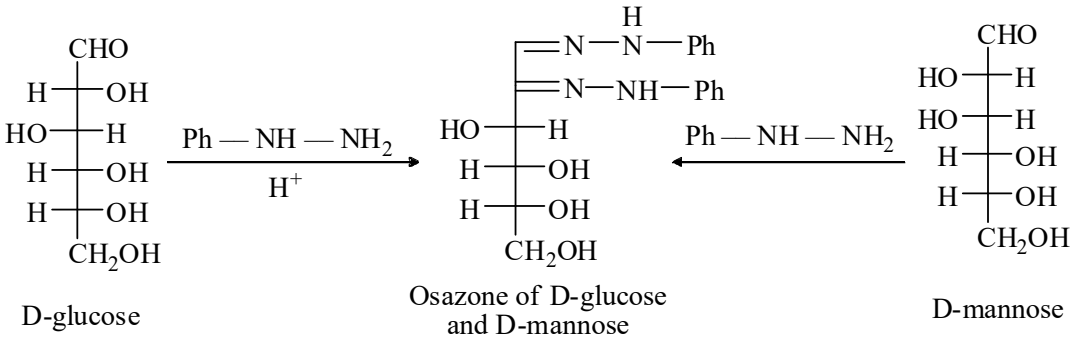
Aspartic acid

$PI = \frac{4.3 + 2.2}{2} = 3.25$. Average pK_a value of the similar ionizable groups.

Correct option is (b)

QUANTA CHEMISTRY CLASSES

10.

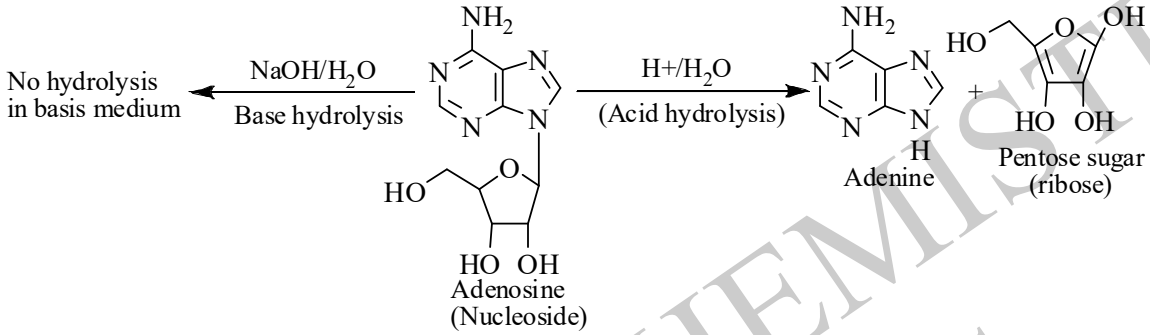


D-glucose | Osazone of D-glucose and D-mannose | D-mannose

During Osazone formation stereocentre of C_2 is lost. D-glucose and D-mannose are distereomers

Correct option is (c)

11.



Correct option is (a)

12. 1 → Terpene, II → Stereoid, III → Alkaloid, IV → DNA base

Correct option is (b)

13. Different configuration at only first position known as anomer. Different configuration at any other centre known as epimers.

So, I and III are anomers

Correct option is (d)

14. Statement (I) and (II) are correct.

III. m-RNA carries the genetic information to the site of DNA replication

IV Nucleoside contains a ribose ordeoxyribose and base only.

Correct option is (a)

15. $t_{1/2} = 28.4$ min

$$K = \frac{0.693}{t_{1/2}} = 0.0244 \text{ min}^{-1}$$

$$[A]_0 = 8 \text{ mM}; [A] = 1.0 \text{ mM}; \text{In}\frac{[A]_0}{[A]} = Kt; t = 85.2 \text{ min}$$

Correct option is (c)

16. The monoprotonation of adenine in acidic solution occurs at second position due to stablization of positive charge.

Correct option is (b)

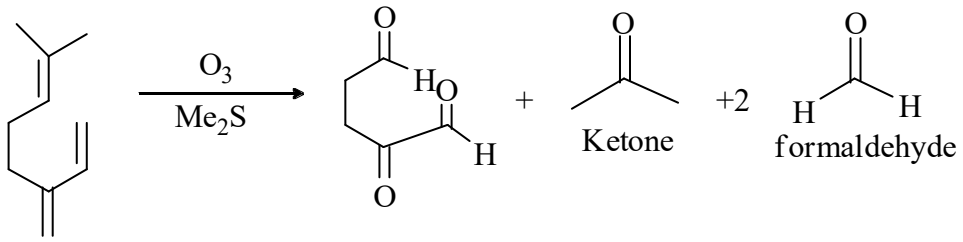
17. (i)Enzyme trypsin cuts the peptide chain from c-terminal side of Arg, Cys

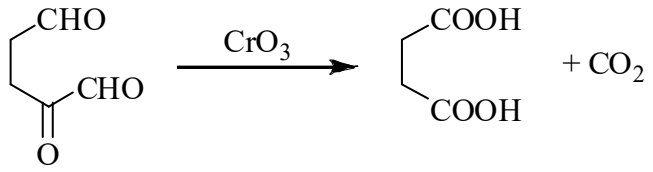
(ii) Chemotrysin cuts peptide chain from c-terminal side of Phe, Trp, Tyr

QUANTA CHEMISTRY CLASSES

(iii) Carboxypeptidase cuts peptide chain from c-terminal side.

Correct option is (a)

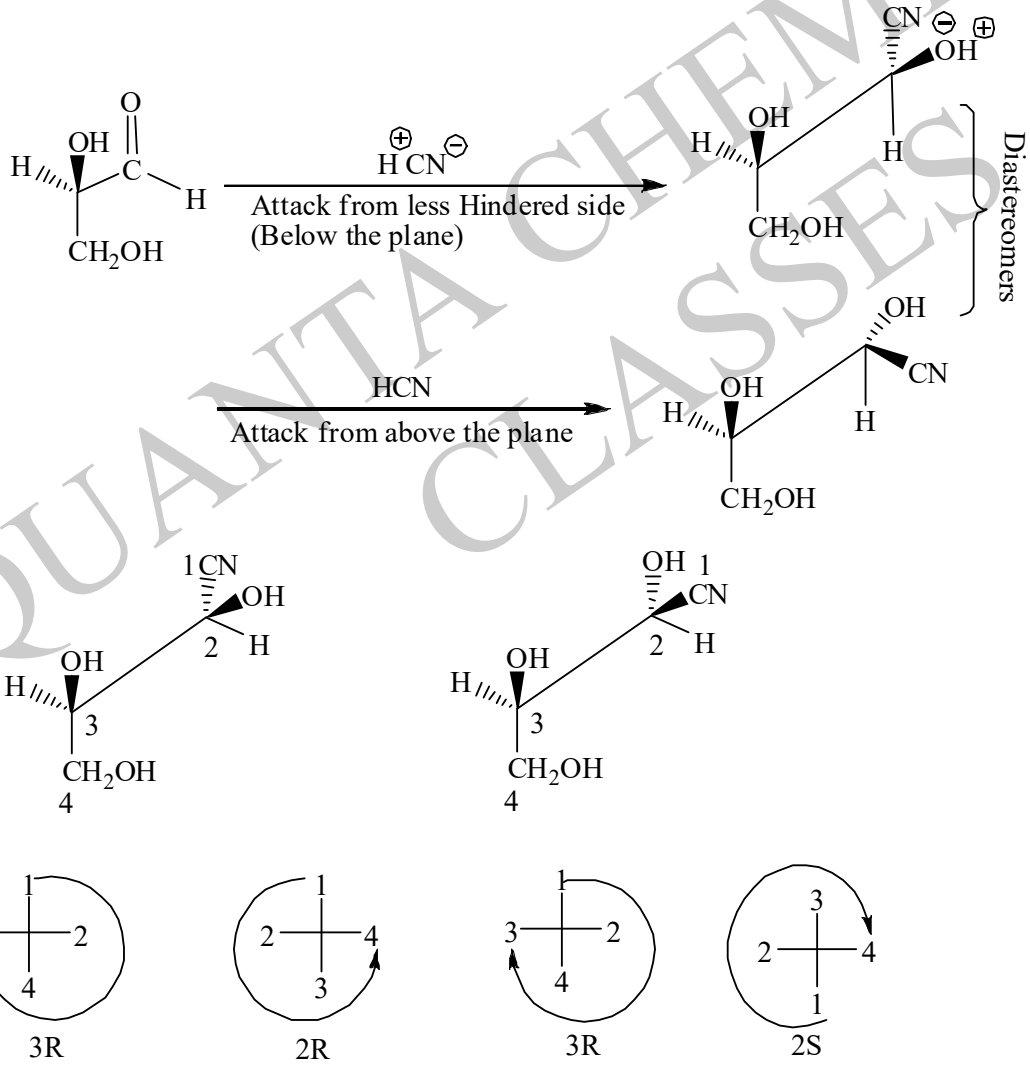
18. 

19. 

Correct option is (a)

20. The chemical cyanogen bromide (CNBr) hydrolysis the peptide chain from c-terminal side of methionine.

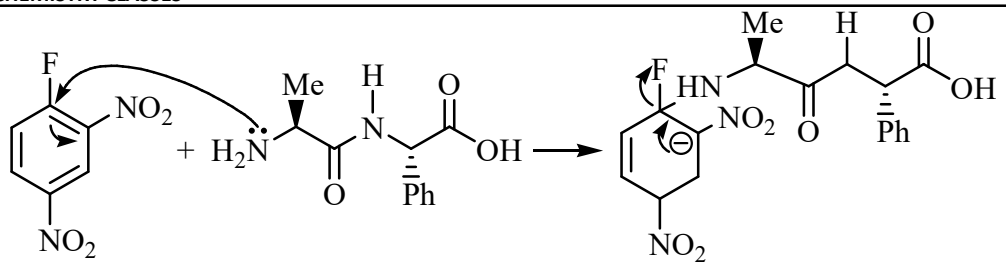
Correct option is (a)

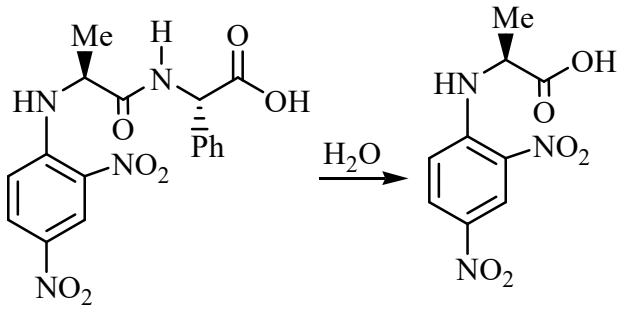
21. 

Correct option is (a)

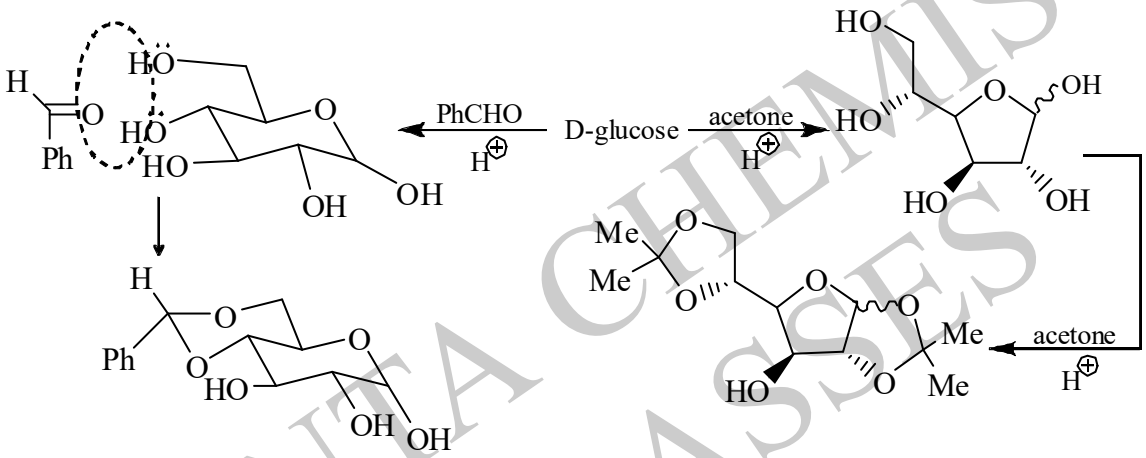
QUANTA CHEMISTRY CLASSES

22.





23.



Correct option is (d)

24. Isoelectric point of basic aminoacid ~ 9 – 10

Isoelectric point of acidic amino acid ~ 3 – 3.5

Isoelectric point of neutral amino acid ~ 5.5 ~ 6

So, Lysine → basic amino acid

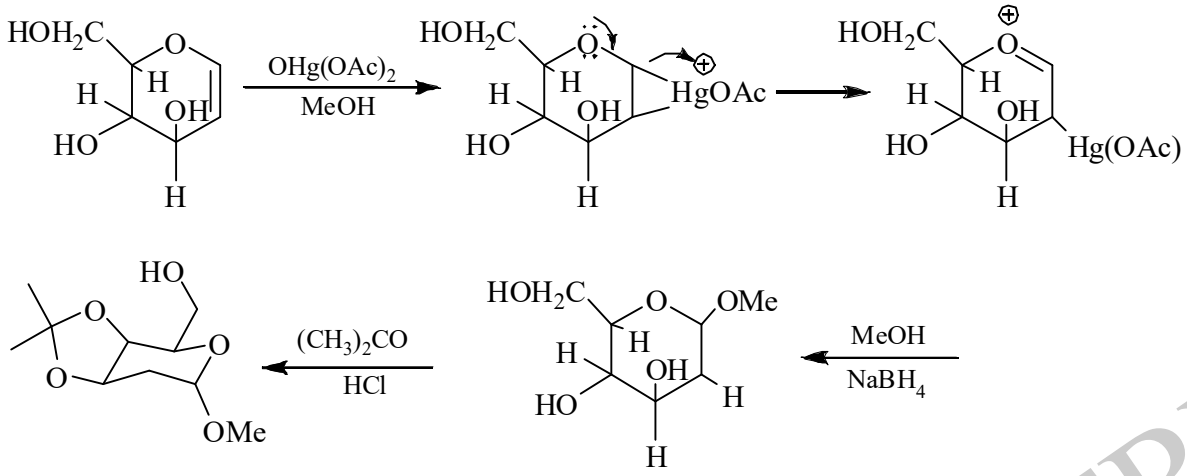
Alanine → neutral amino acid

Glutamic acid → acidic amino acid

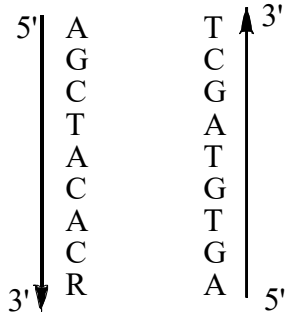
So, the order is I > II > III

Correct option is (a)

QUANTA CHEMISTRY CLASSES

25. 

Correct option is (d)

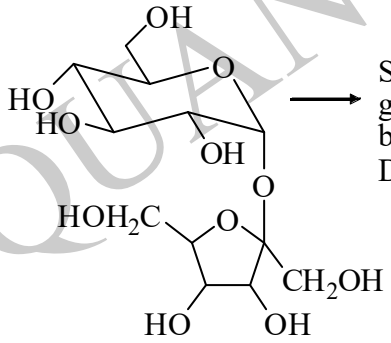
26. 

Because base pairing between
$A \rightarrow T$
$G \rightarrow C$

Correct option is (c)

27. $23\% = 23\%\ C \Rightarrow 46\% = G + C \Rightarrow 54\%\ A + T \Rightarrow A = T = 27\%$
$\Rightarrow 27\%$ of 5000 kb $\Rightarrow 1.350$ kb $= 1.35000 = 1.35 \times 10^6$

Correct option is (c)

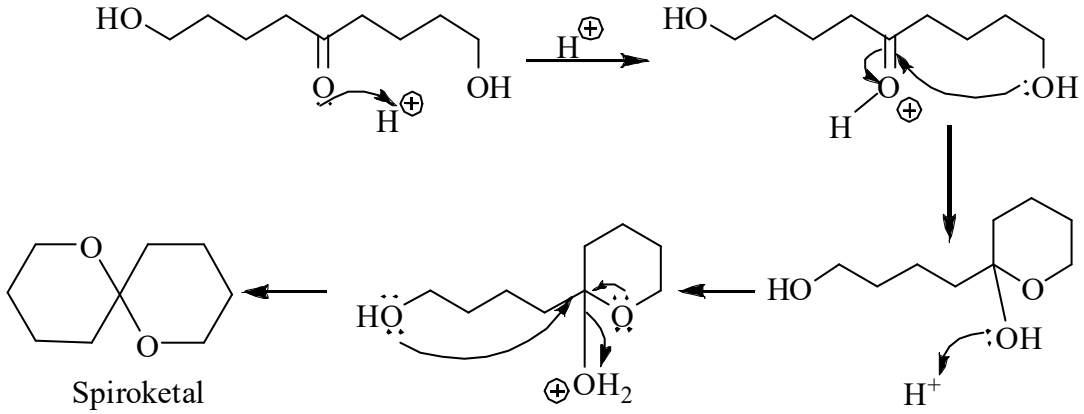
28. 

Sucrose is a non-reducing sugar, it does not give benedict's test and will not from osazone, because it has a glycosidic linkage both at D-glucose and D-fructose

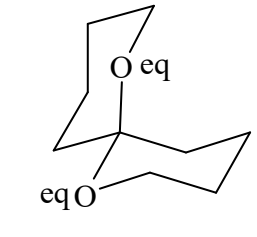
Correct option is (d)

QUANTA CHEMISTRY CLASSES

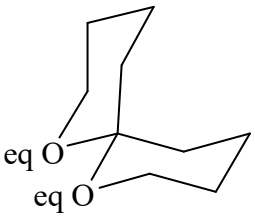
29.



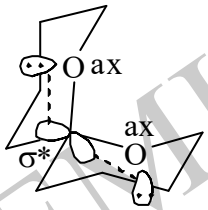
Following stereochemistry is possible with this spiroketal structure.



One anomeric effect



No anomeric effect

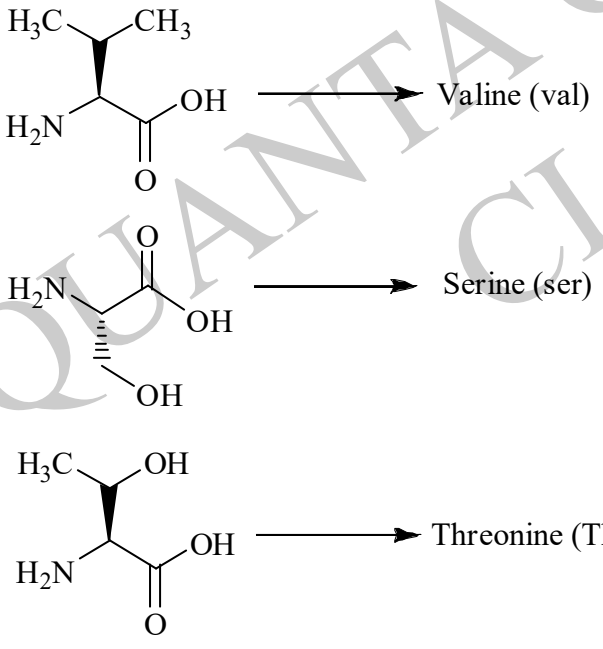


Most stable conformation

Two anomeric effect

Correct option is (a)

30.

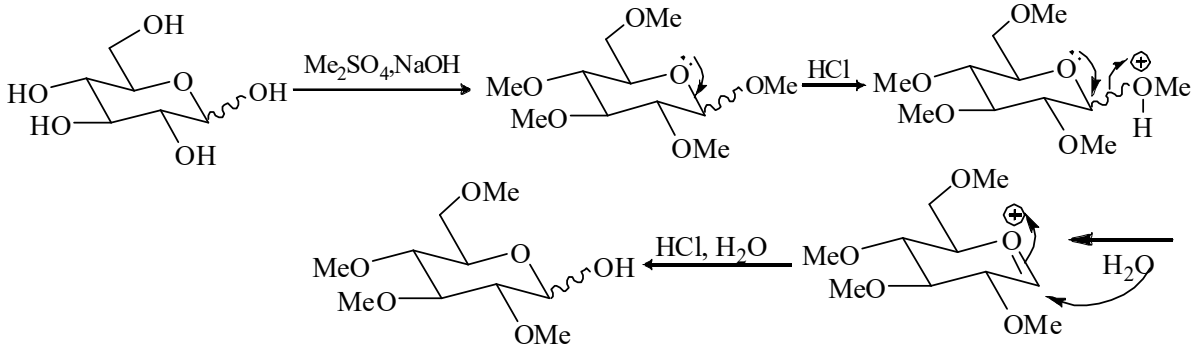


So, the correct sequence of the tripeptide is val–ser–thr

Correct option is (a)

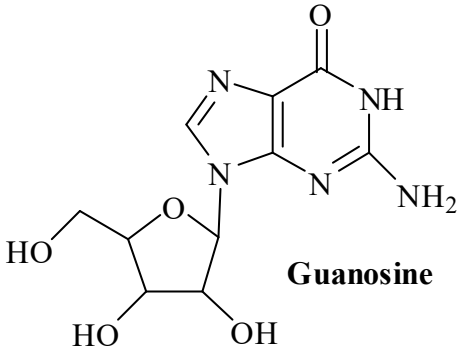
QUANTA CHEMISTRY CLASSES

31.



Correct option is (c)

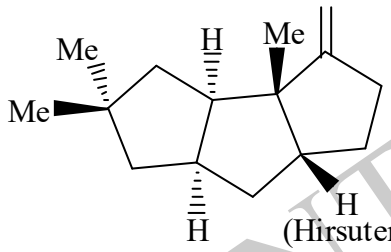
32.



Guanosine

Correct option is (d)

33.



(Hirsutene)

$$\text{Number of isoprene unit} = \frac{\text{Number of carbon atom}}{5}$$

$$= \frac{15}{5} = 3$$

Hirsutene is a sesquiterpene molecular formulla $C_{15}H_{24}$. Having three isoprene units.

Correct option is (c)

34. Disaccharide (a), (c) and (d) have glycose linkages at both the anomeric carbons, hence they give negative Tollen's test. While as disaccharide (b) gives positive Tollen's test. Upon hydrolysis disaccharide (a) is hydrolysed into D-glucose and D-fractose. While as disaccharide (c) is converted into 2-moles of D-glucose. Disaccharided upon hydrolysis is converted in D-glucose and D-galactose both of which gives Br_2/H_2O test.

Correct option is (d)

35. Ala-Phe-Gly-Leu

Ala-Leu-Gly-Phe

Ala-Phe-Leu-Gly

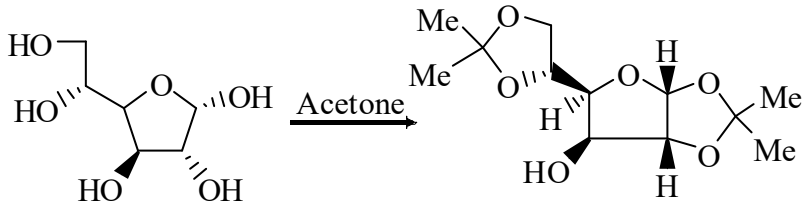
Ala-Leu-Phe-Gly

Correct answer is (4)

QUANTA CHEMISTRY CLASSES

36. $\alpha - D - Glucose \xrightarrow[H^+]{Acetone\ (Excess)}$

Furanose form of glucose



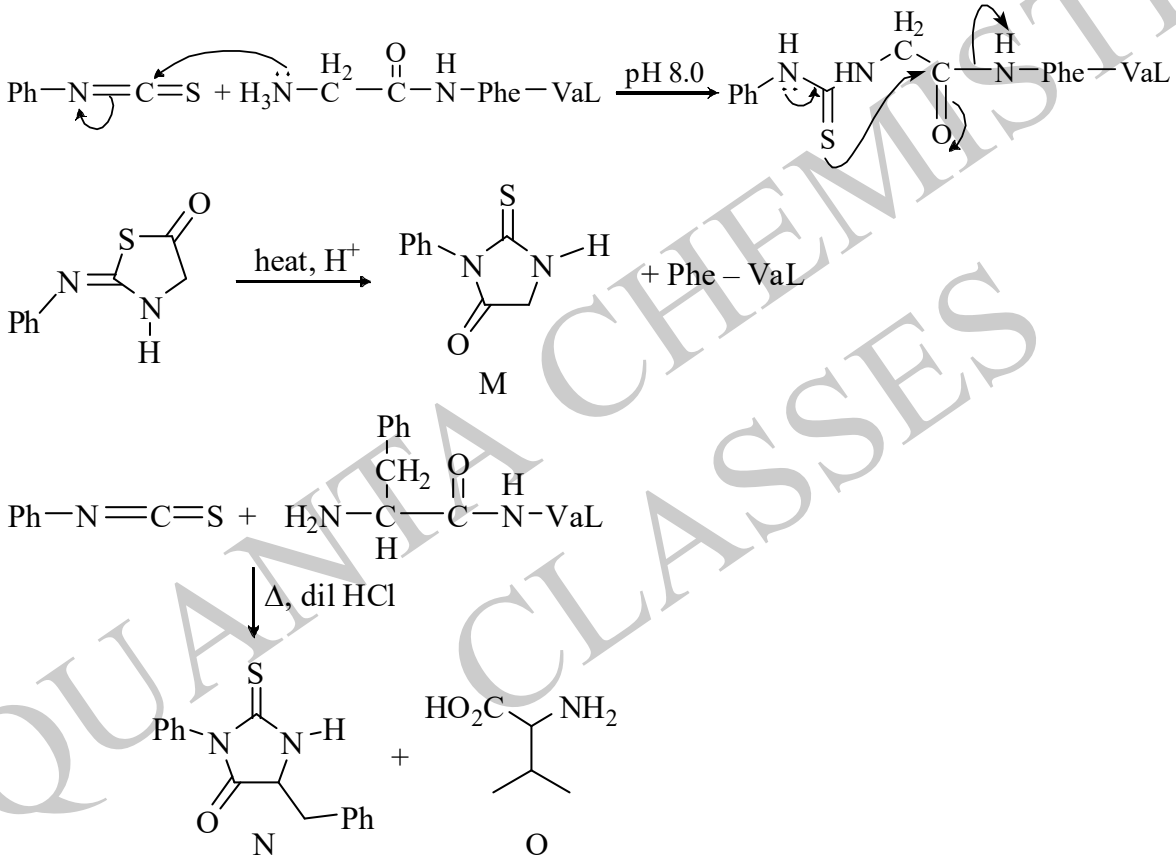
Acetone /H^+ → Protect cis 1-2 diols.

Correct option is (a)

37. adenosine monophosphate (AMP)

Correct option is (b)

38.



Correct option is (a)

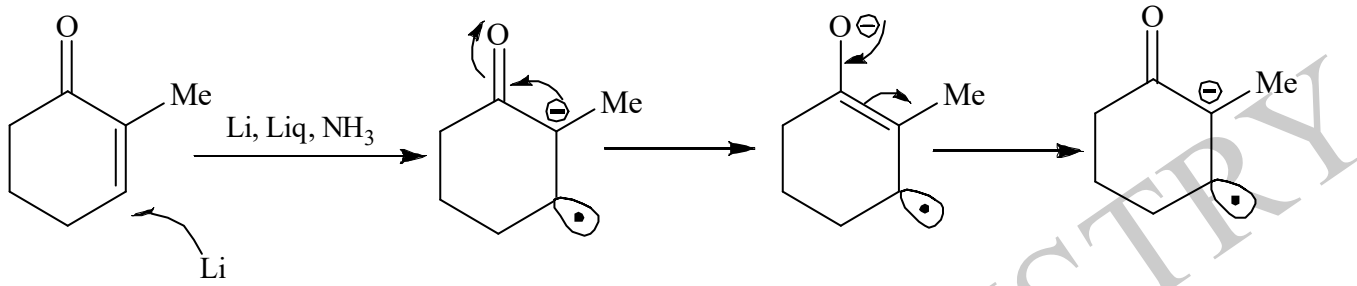
QUANTA CHEMISTRY CLASSES

REAGENT

HINTS & SOLUTION

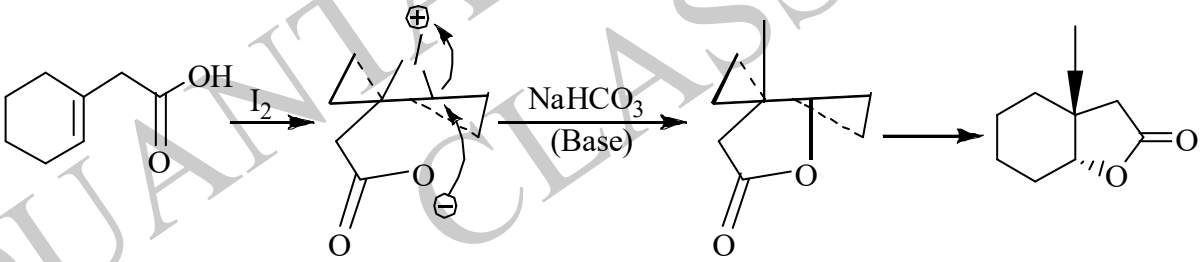
GATE-2005

1.



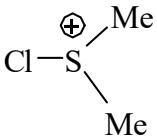
Correct option is (c)

2.

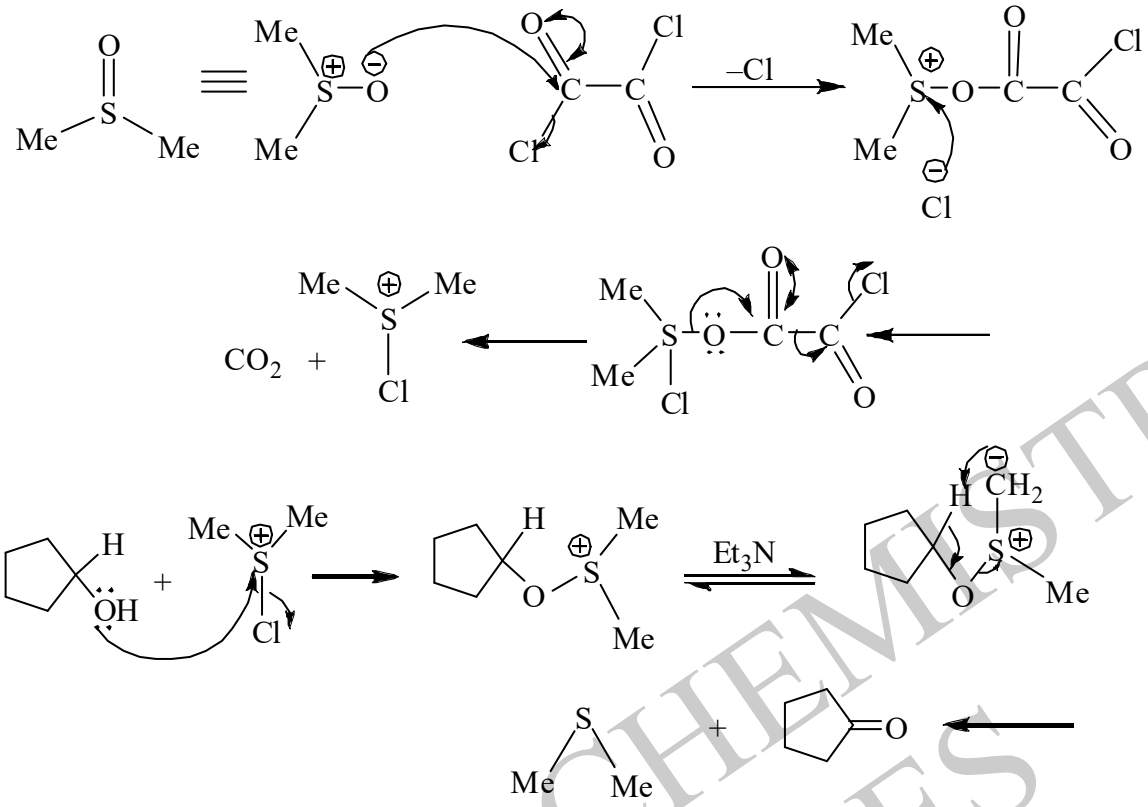


Correct option is (d)

GATE-2006

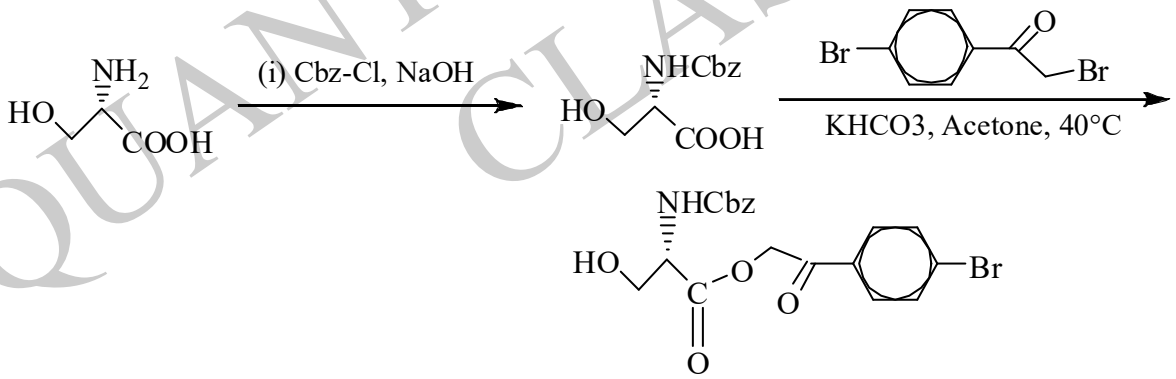
3. DMSO reacts with $(COCl)_2$ initally to give 

QUANTA CHEMISTRY CLASSES



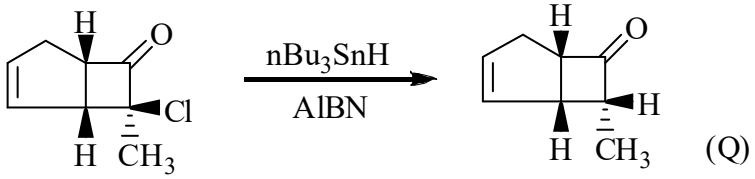
Correct option is (c)

4.



Correct option is (d)

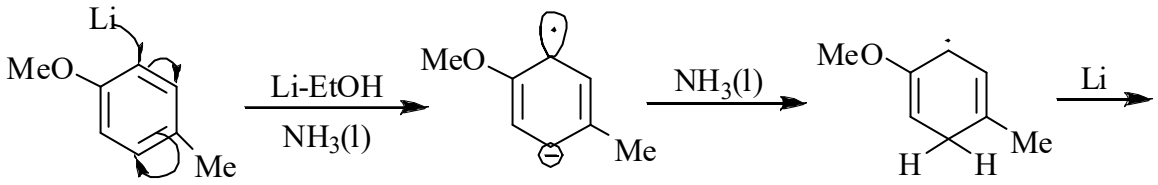
5.



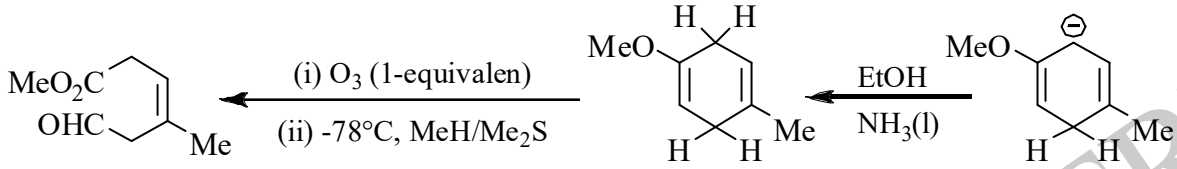
(Q)

Correct option is (c)

QUANTA CHEMISTRY CLASSES



6.



Product (Q) Product (P)

Ozonolysis occurs on electron rich double bond.

In the presence of MeH/Me_2S reductive ozonolysis takes place.

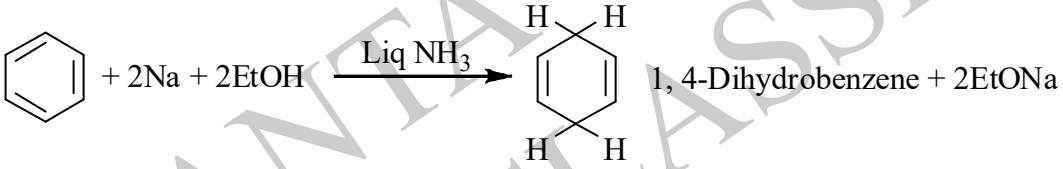
Correct option is (d)

7. Na $(CH_3COO)_3$ BH selective reducing agent for aldehyde.

Correct option is (c)

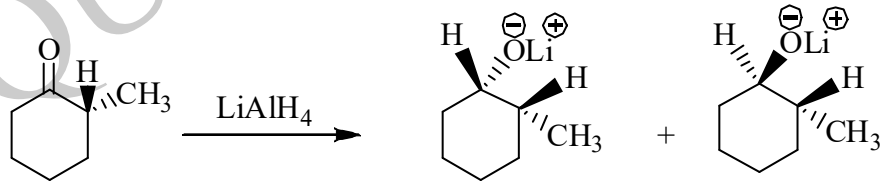
GATE-2007

8. Birch Reaction :

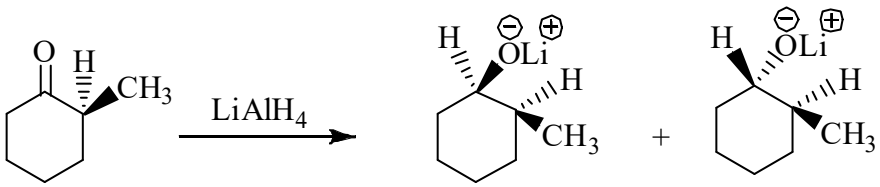


Correct option is (a)

9.



(R) 2-methyl cyclo hexanone major minor



(S) 2-methyl cyclo hexanone major minor

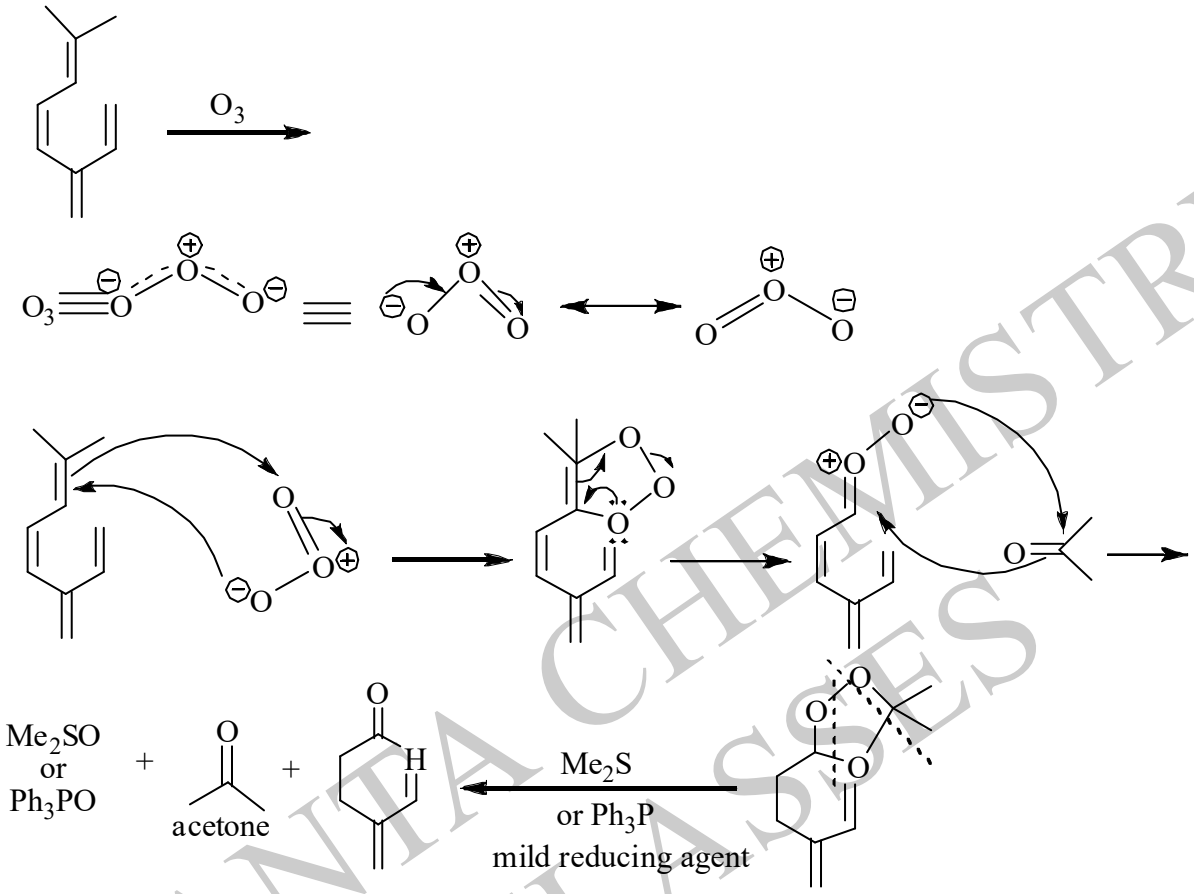
Reduction of (R) or (S)-2-methylcyclohexanone by $LilH_4$ is a stereoselective reaction. Reduction of carbonyl

QUANTA CHEMISTRY CLASSES

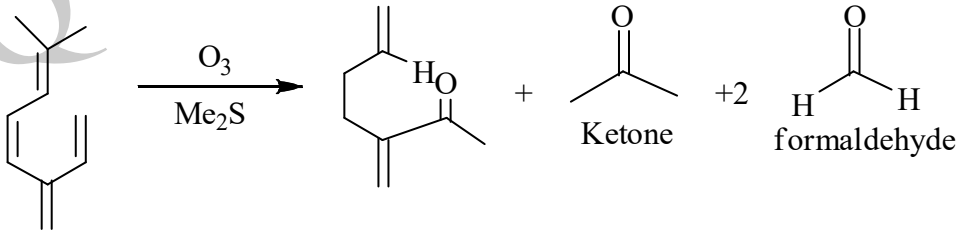
group by $LiAlH_4$ is possible from both side (above and below the plane). The major product (select) fromed from less hindered side.

Correct option is (d)

10.

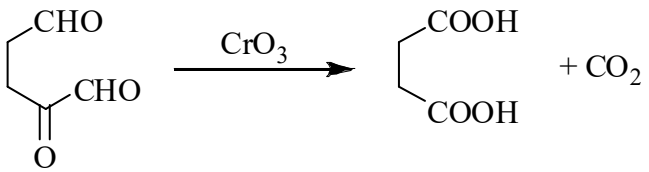


Same ozonolysis (mechanism) on remaining both double bond observed product is



Correct option is (b)

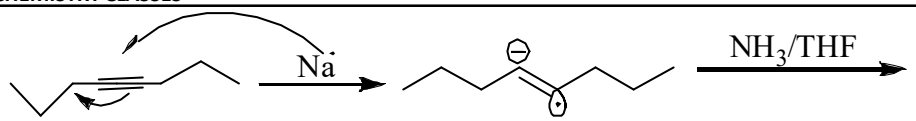
11.

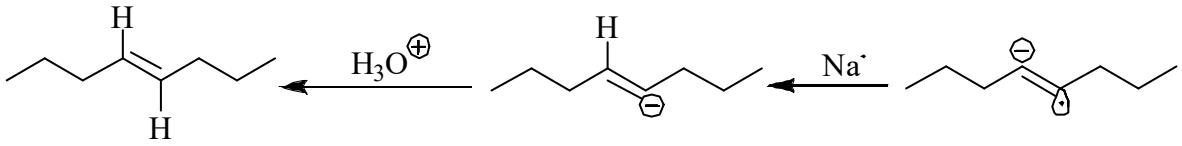


Correct option is (a)

GATE-2008

QUANTA CHEMISTRY CLASSES

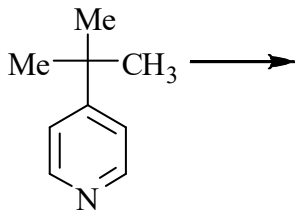


12. 

trans alkene

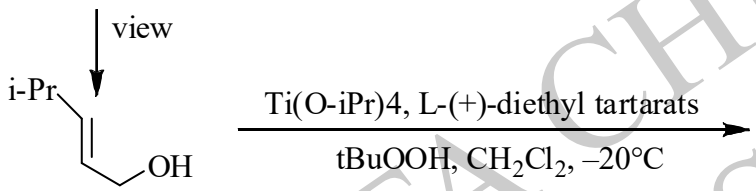
Correct option is (c)

13. Compound which lack benzylic hydrogen is not oxidized by $KMnO_4$.



No Benzylic hydrogen in the compound hence will not be oxidized by $KMnO_4$.

Correct option is (d)

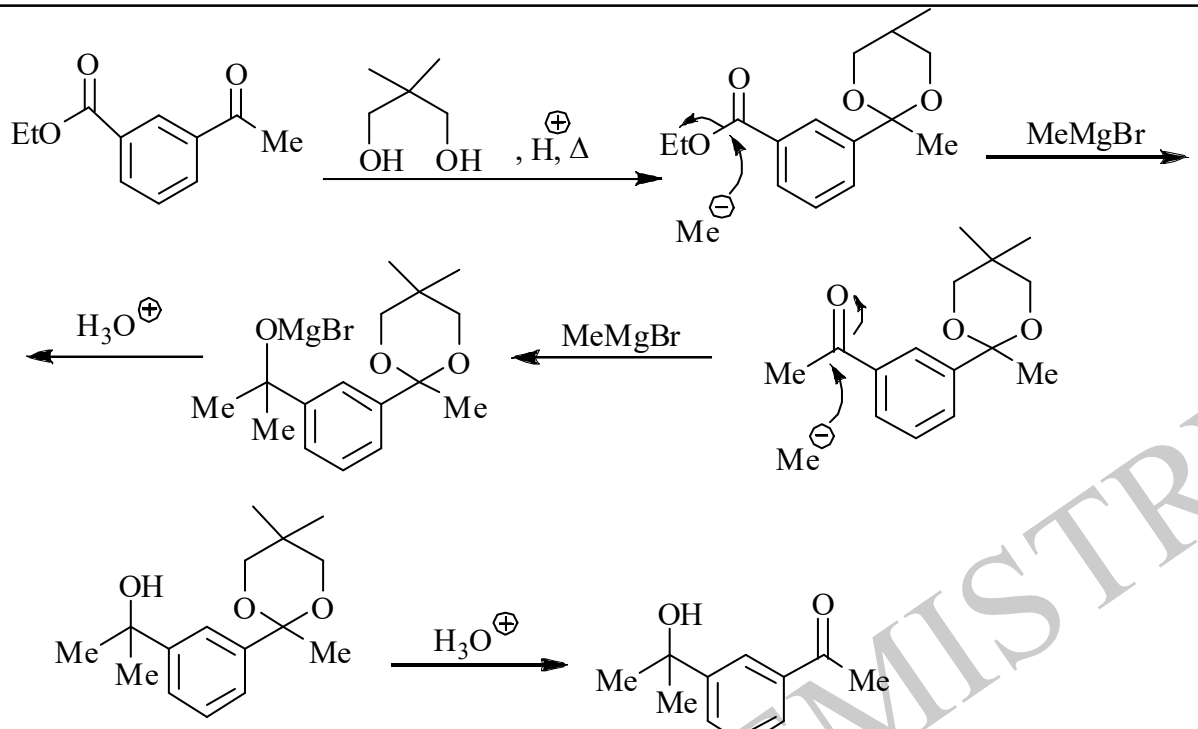
14. 

As trick, view from above side, hydroxyl group takes place on left side and reagent is L-(+)-diethyltartrate, so epoxide formed below the plane.

Correct option is (d)

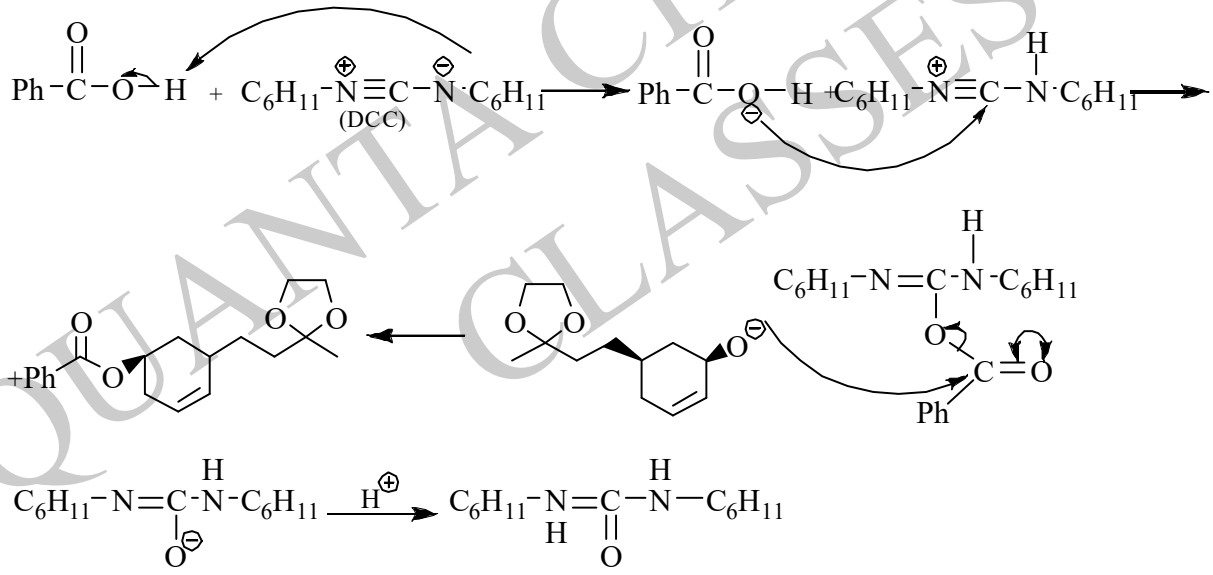
15. 1-3 diols protect ketone (group selectivity)

QUANTA CHEMISTRY CLASSES



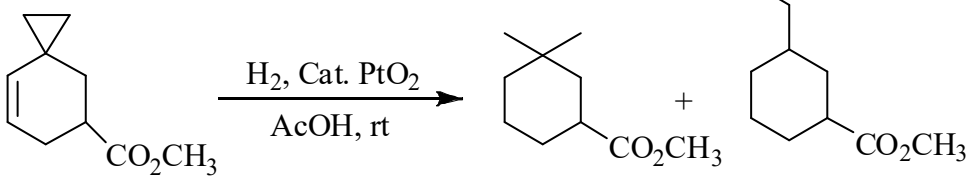
Correct option is (b)

16.



Correct option is (d)

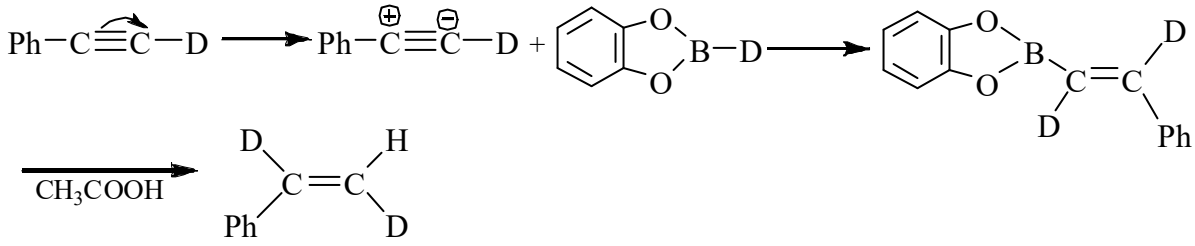
17. PtO_2 preffered the reduction of highly strained cyclopropane ring over double bond



Correct option is (c)

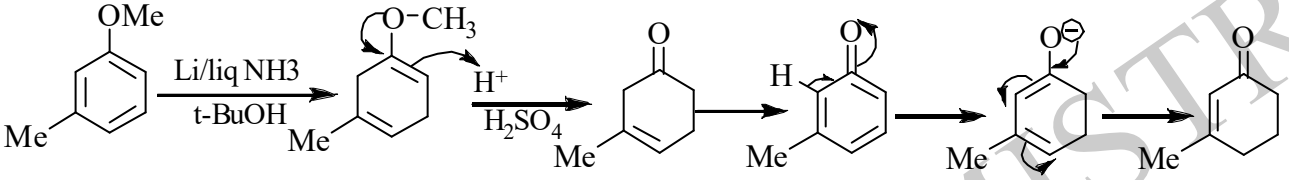
QUANTA CHEMISTRY CLASSES

18.



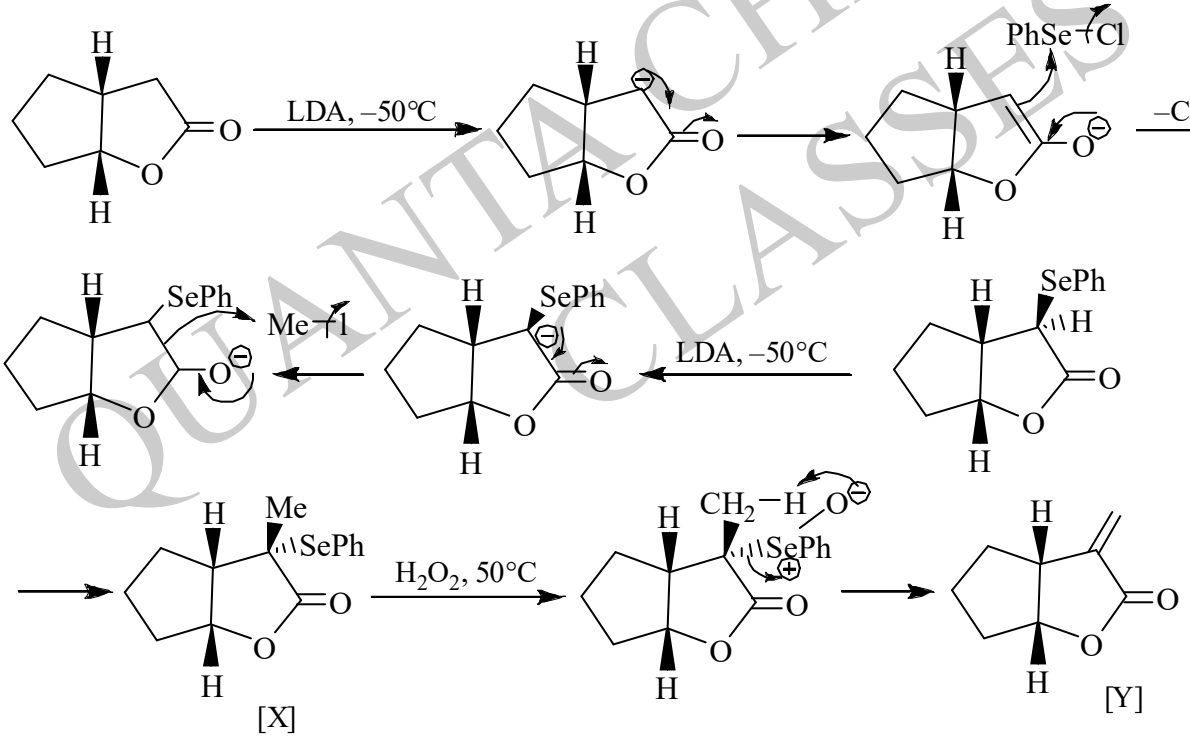
Correct option is (c)

19.



Correct option is (d)

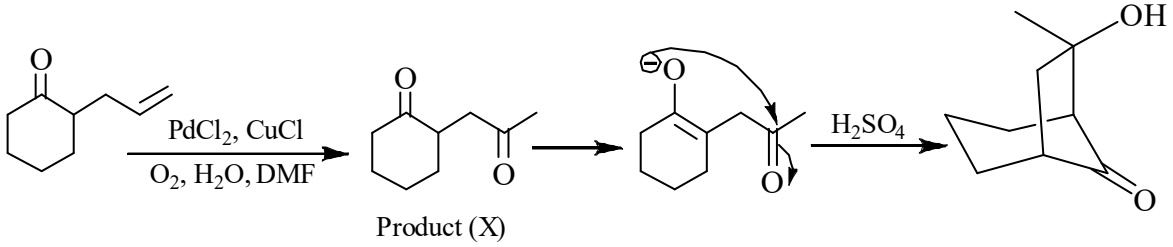
20.



Correct option is (a)

QUANTA CHEMISTRY CLASSES

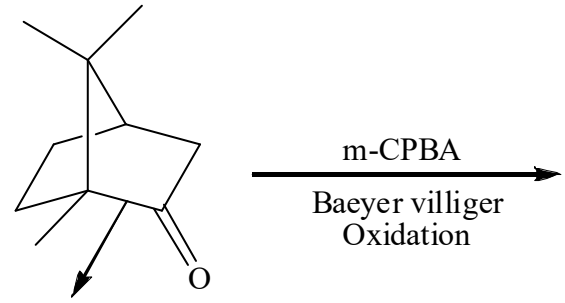
21.

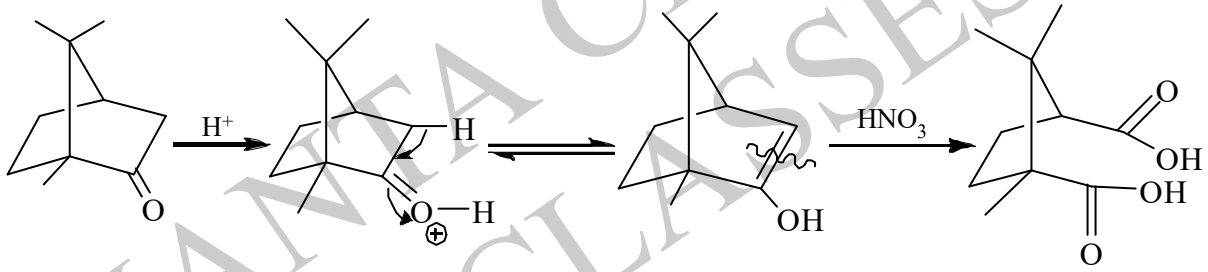


Correct option is (c)

GATE-2010

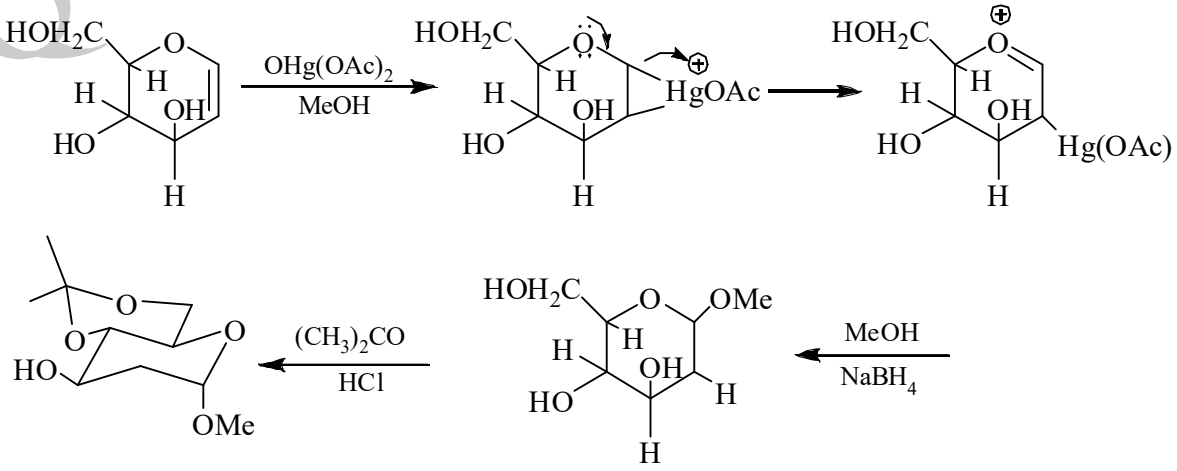
22.





Correct option is (b)

23.

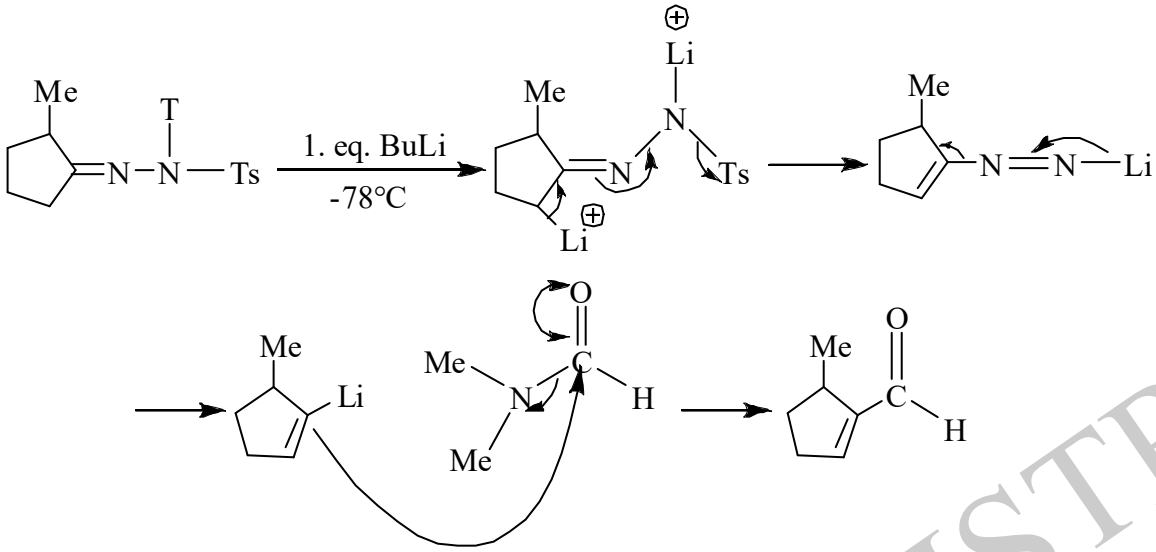


Correct option is (c)

GATE-2011

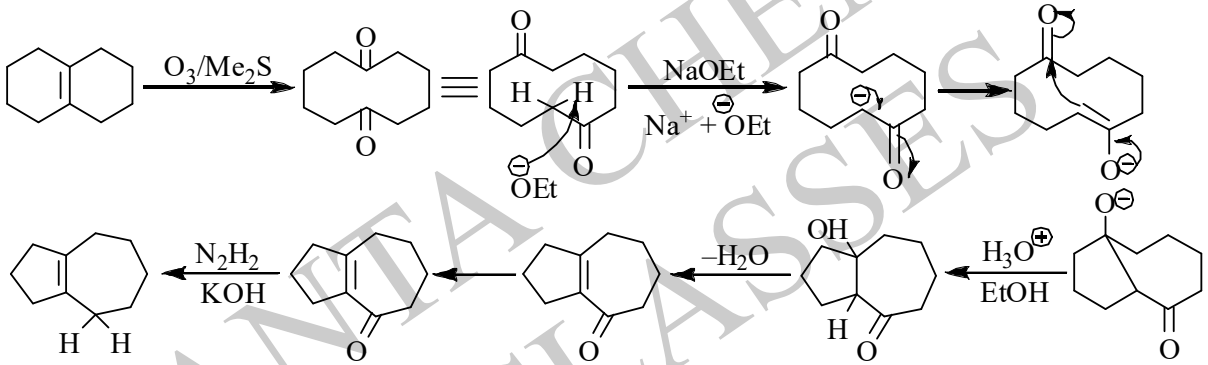
QUANTA CHEMISTRY CLASSES

24.



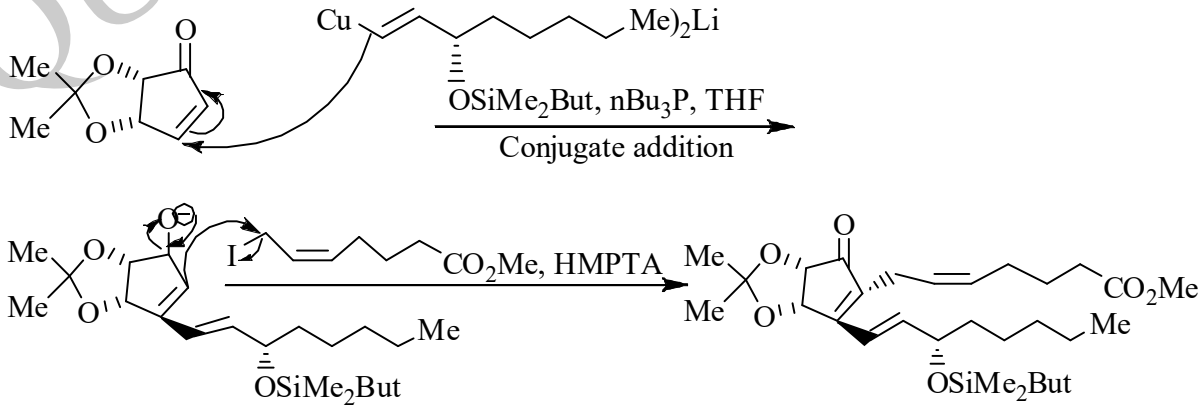
Correct option is (c)

25.



Correct option is (d)

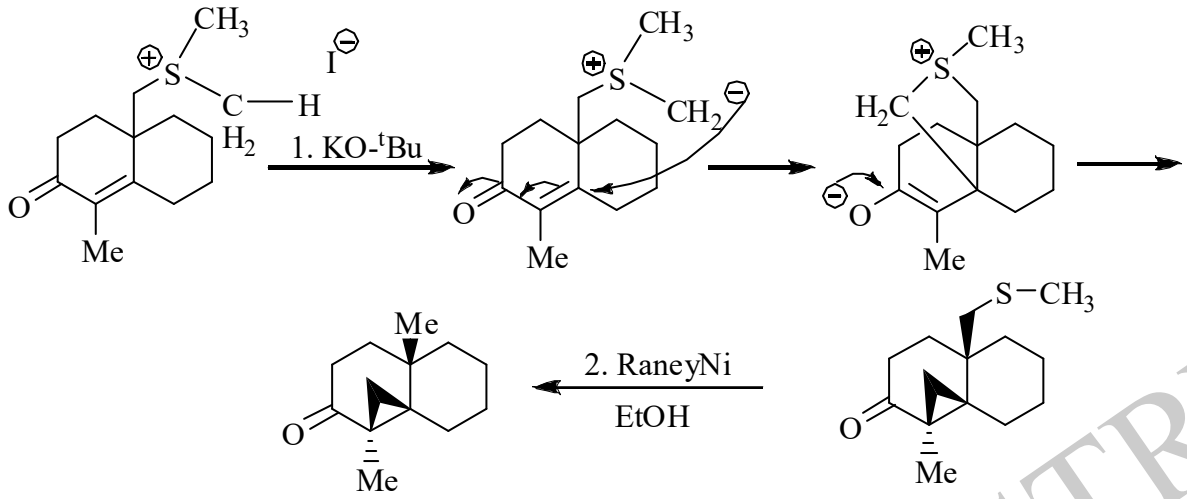
26.



Correct option is (a)

QUANTA CHEMISTRY CLASSES

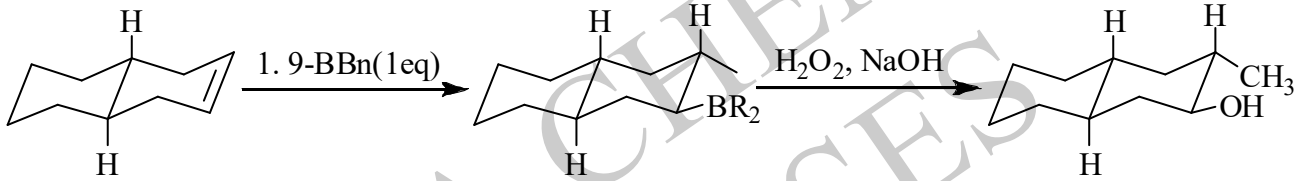
27.



Correct option is (b)

GATE-2012

28.



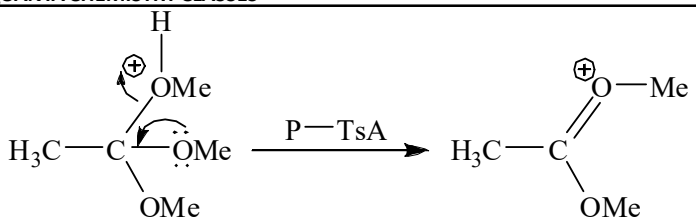
In the case of (A)

Hydroboration occurs in syn number on double bond. Hydrogen present on axial position due to less 1-3 diaxial interaction than CH_3, which present on equatorial position.

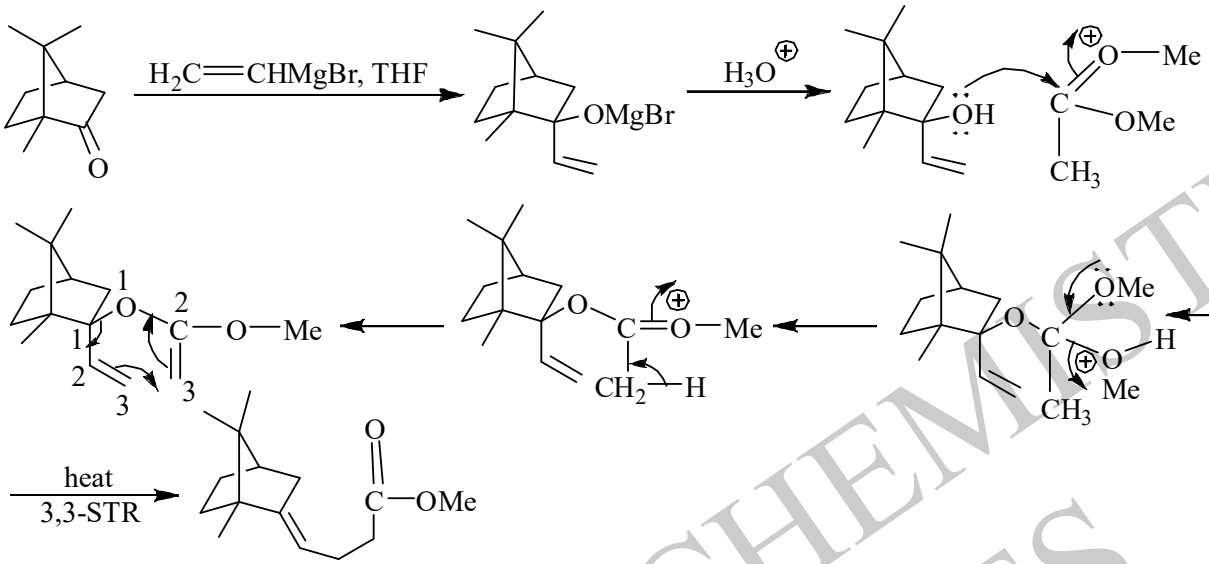
Correct option is (a)

29.

QUANTA CHEMISTRY CLASSES



(endo attack
less hindered side)

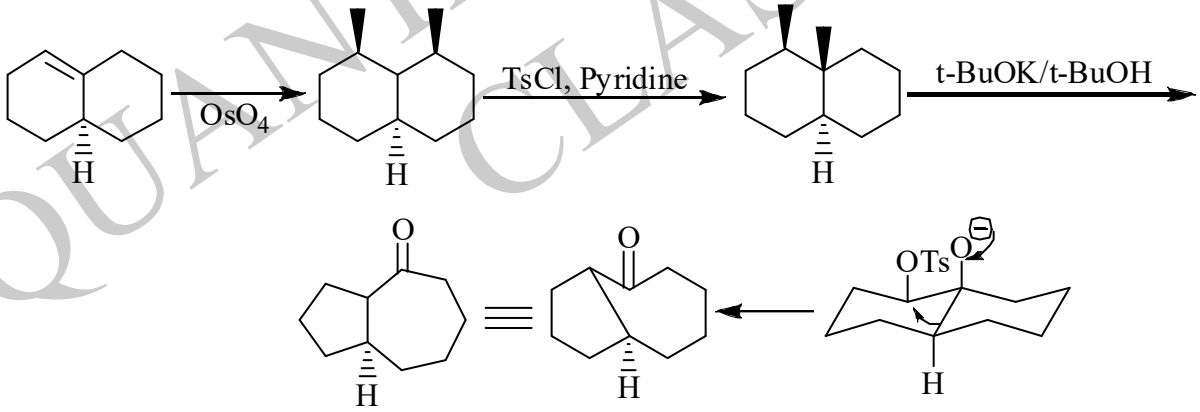


Correct option is (c)

30. For syn addition OsO_4 used.

Correct option is (b)

31.

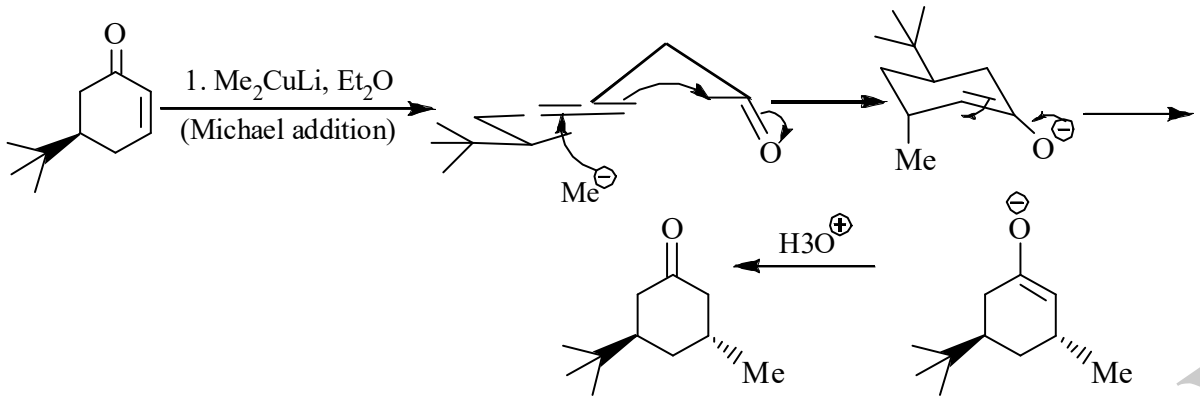


Correct option is (d)

GATE-2013

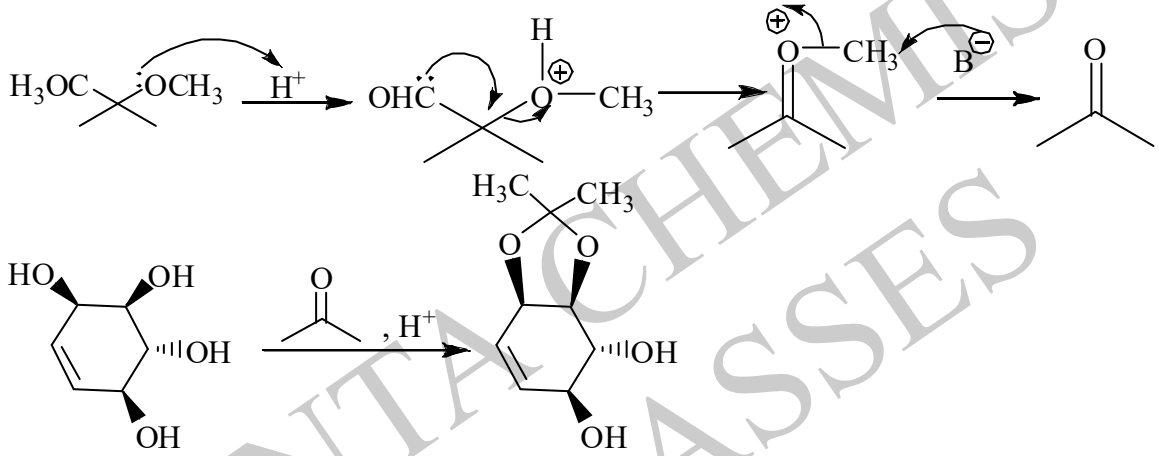
QUANTA CHEMISTRY CLASSES

32.



Correct option is (d)

33. cis-diol undergoes protection faster than that of trans–diol.



Correct option is (c)

GATE-2014

34. Step I Reaction (A) is 100%, react with reagent observed yield is 90%.

Step II 90% yield of B react with reagent, observed yield is 72%

$$\frac{90\times 80}{100} = 72\%$$

Step II 72% yield react with reagent C observed yield is 57.6

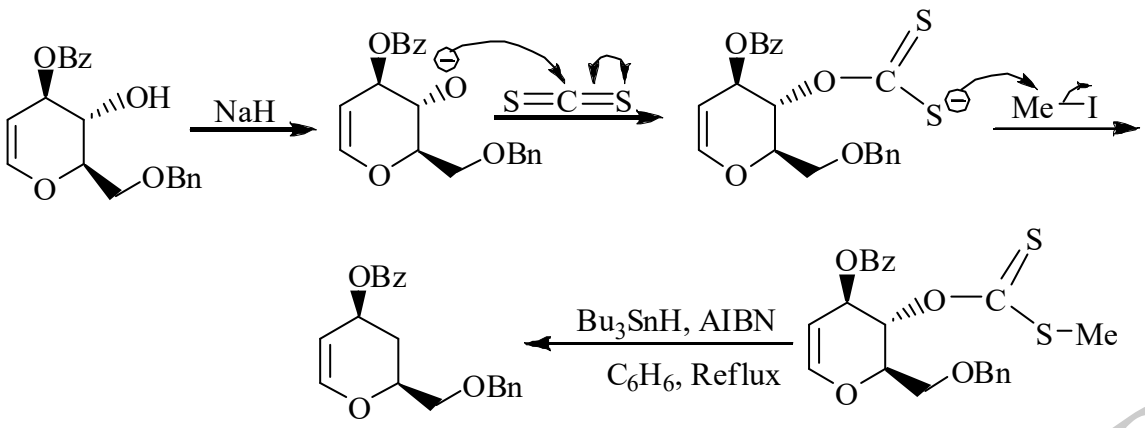
$$\frac{72\times 80}{100} = 57.6$$

Finally observed yield = 57.6

Correct option is (57.6)

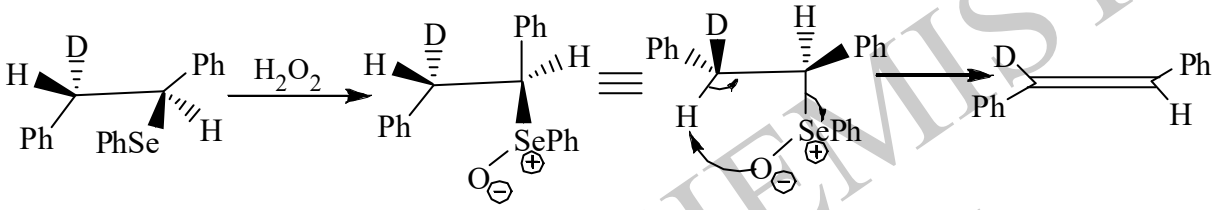
QUANTA CHEMISTRY CLASSES

35.



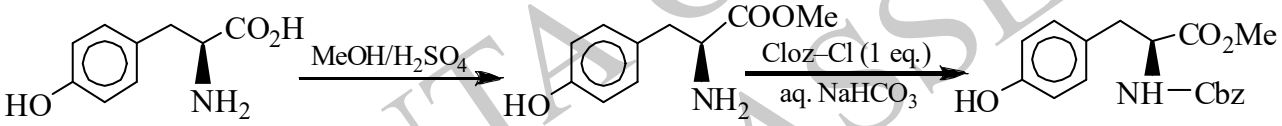
Correct option is (a)

36.



Correct option is (c)

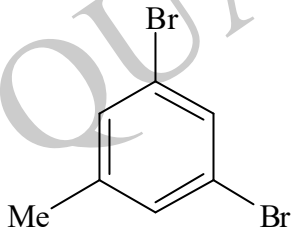
37.



Correct option is (b)

GATE-2015

38.

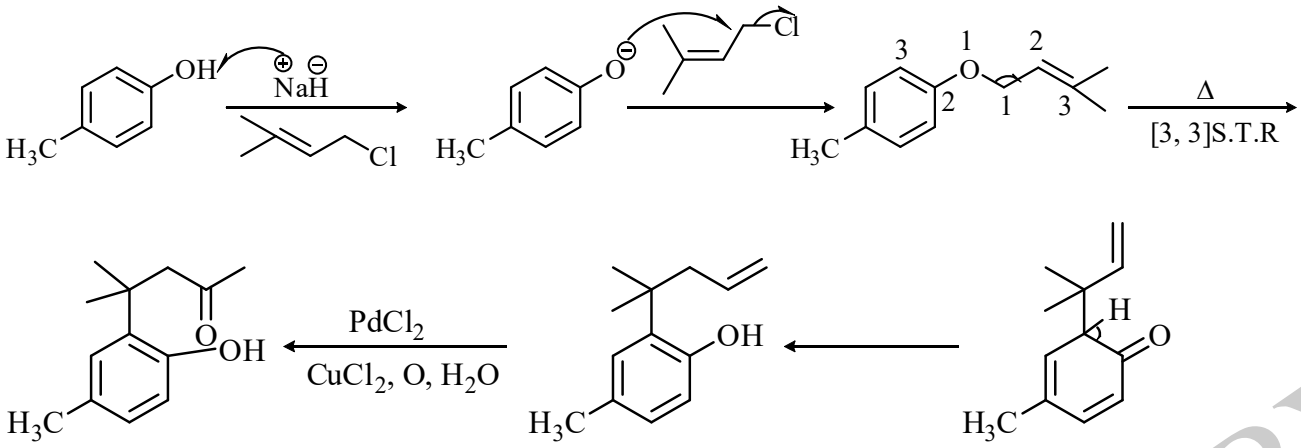


In the mass spectrum of this compound the intensity of bromide is 2 : 1 because bromide has two isotropic i.e., ^{79}Br and ^{81}Br.

Correct option is (a)

39.

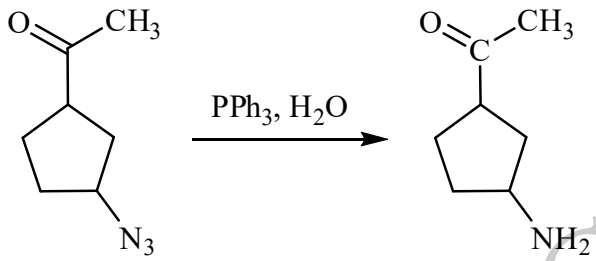
QUANTA CHEMISTRY CLASSES



Correct option is (b)

GATE-2016

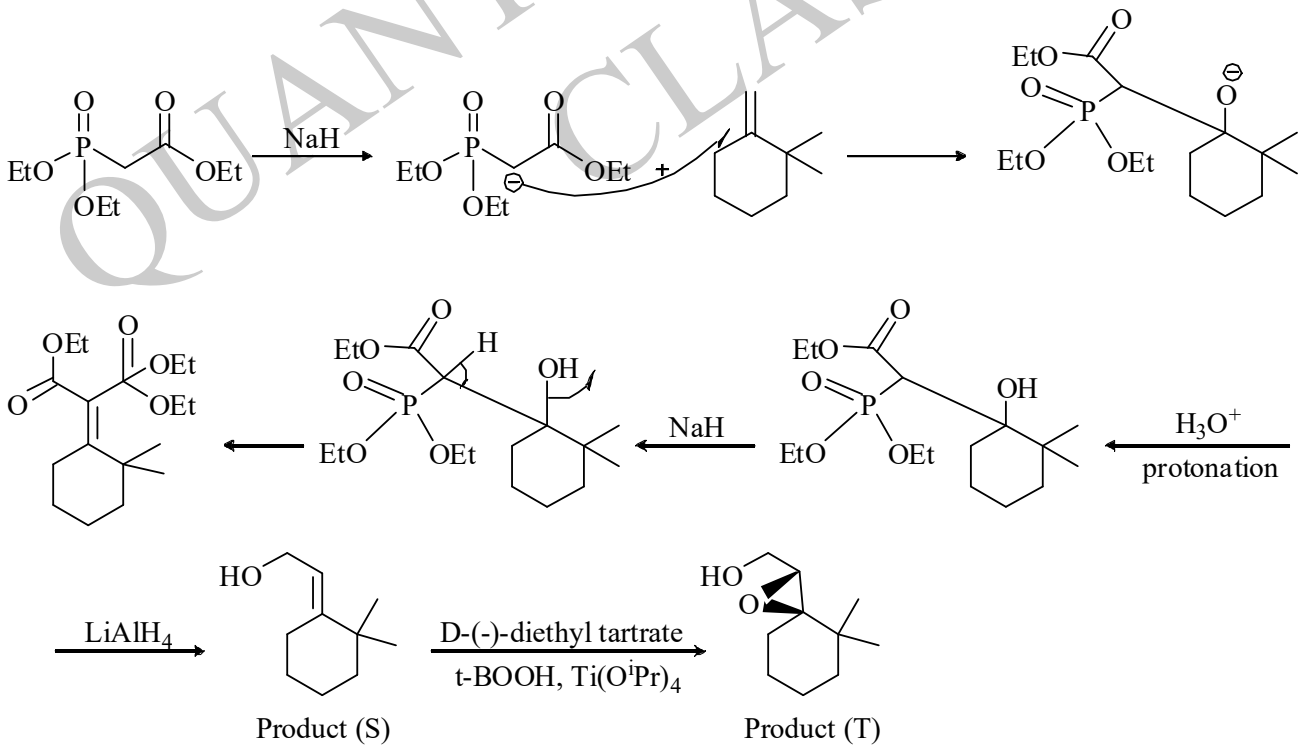
40.



Staudinger reaction, it does not affect the other functional groups.

Correct option is (c)

41.

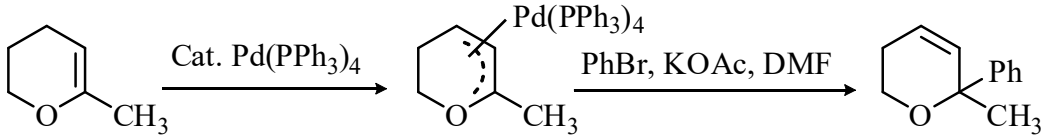


QUANTA CHEMISTRY CLASSES

Correct option is (a)

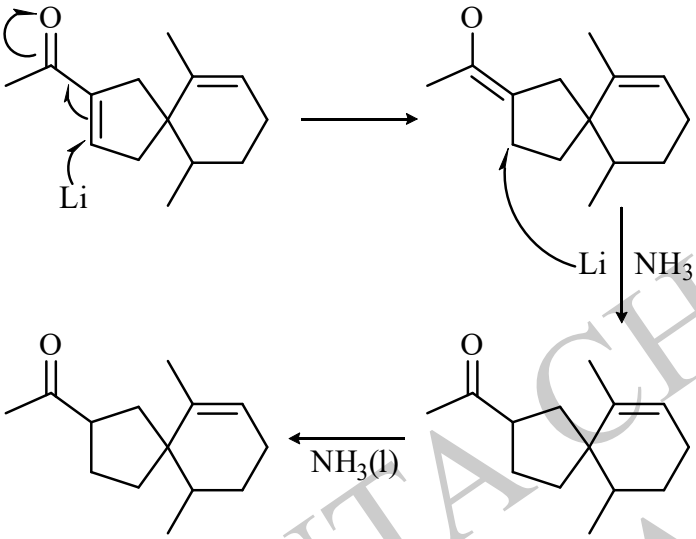
42. "Umpolung concept" polarity inversion in organic chemistry is the chemical modification of a functional group with the aim of the reversal of polarity of that group.

Correct option is (d)

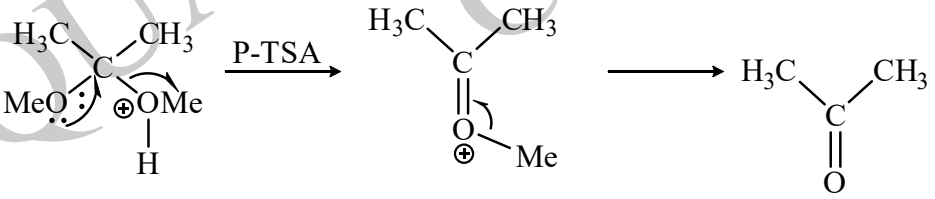
43. 

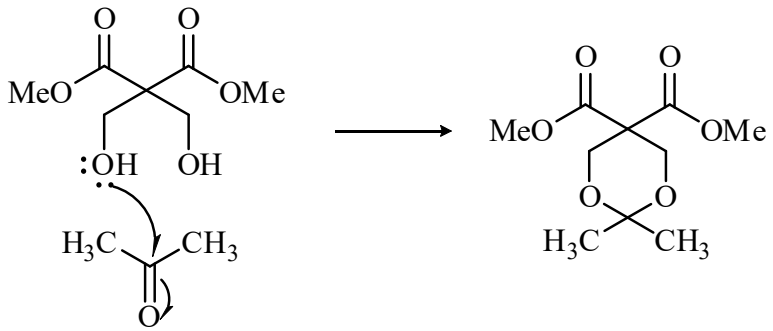
Correct option is (b)

GATE-2017

44. 

Correct option is (a)



45. 

Correct option is (b)

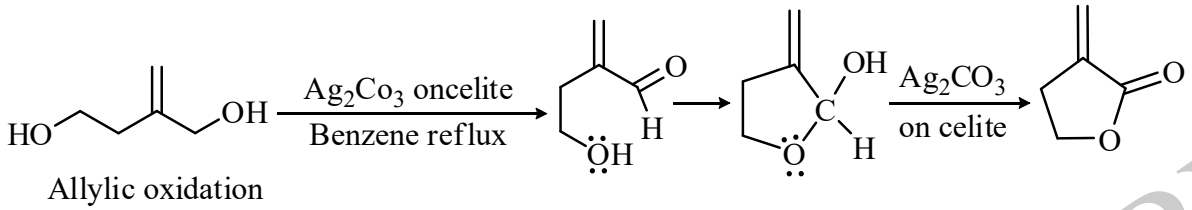
QUANTA CHEMISTRY CLASSES

46. Salient feature of Wilkinson's catalyst aer

- Rate of hydrogeneation of terminal is greater than that of intenal alkene.
- Steric hindance decrease the rate of hydrogenation
- Rate of hydogenation of cis alkene is greater than that of trans-alkene

Correct option is (b)

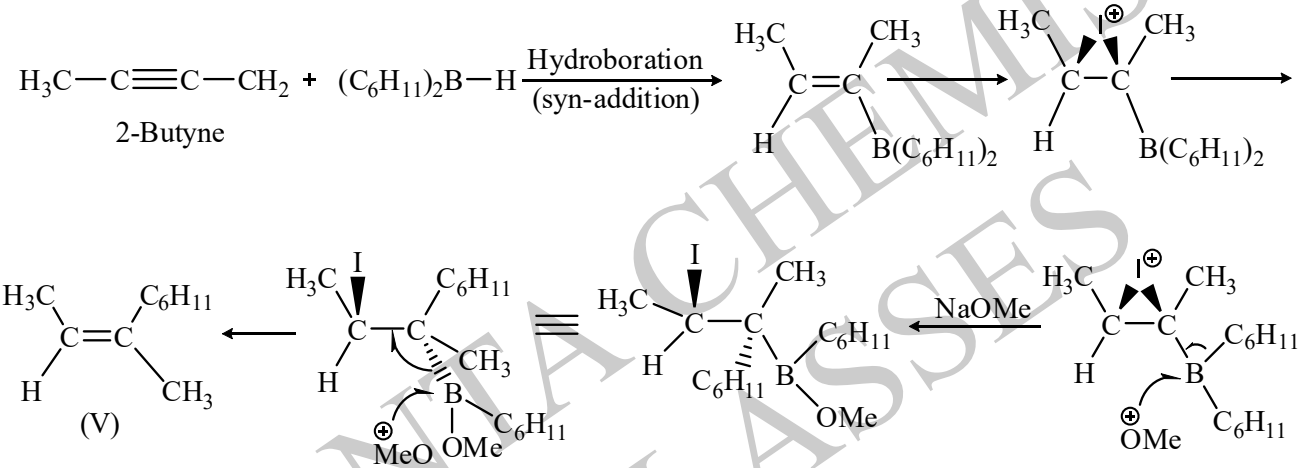
47.



Allylic oxidation

Correct option is (c)

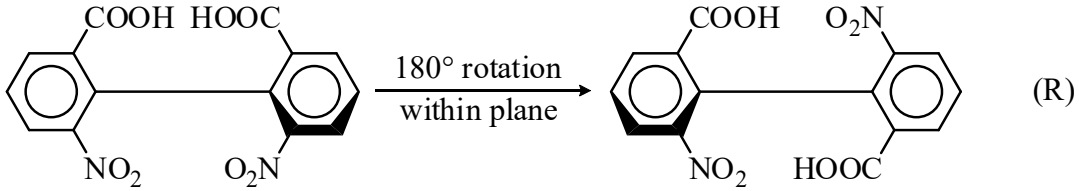
48.



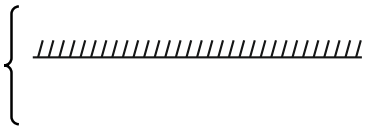
Correct option is (d)

GATE-2018

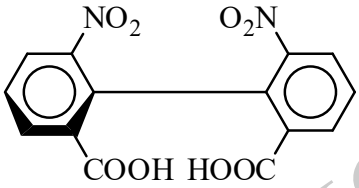
QUANTA CHEMISTRY CLASSES



(R)



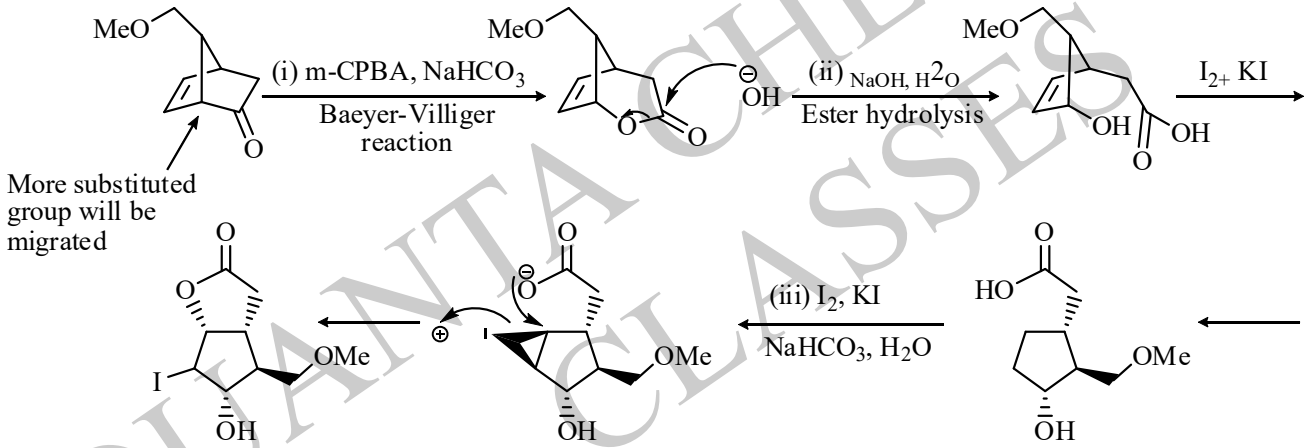
49.



(S)

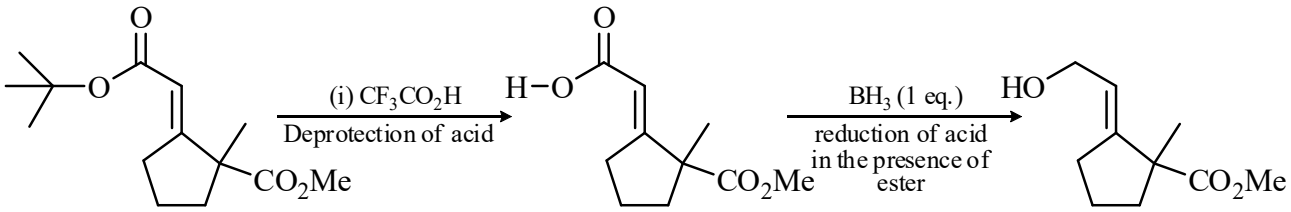
Correct option is (d)

50.



Correct option is (a)

51.



Correct option is (d)

QUANTA CHEMISTRY CLASSES

GATE-2019

52Sol. Using 2nd and 3rd postulate of GOT, we find that

$a = b = c = d = 1$

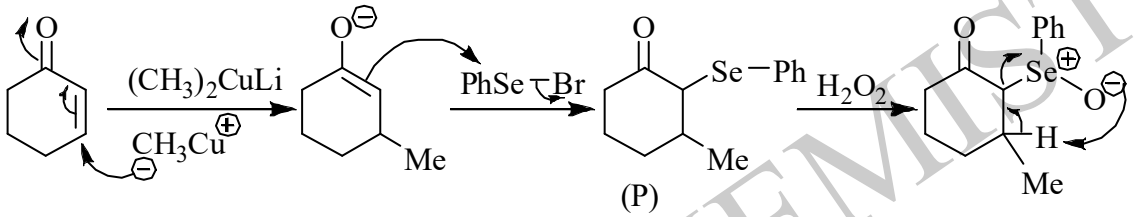
$e = f = g = 2$

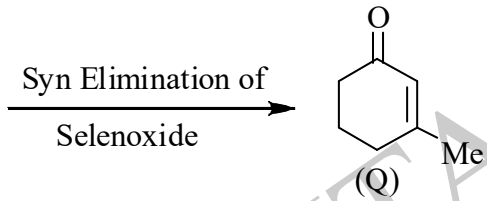
$h = i = j = -1$

$k = 2$

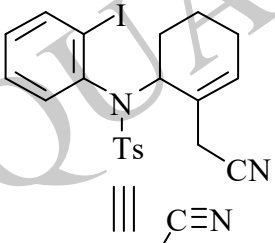
$a + b + c + d + e + f + g + h + i + j + k = 9$

53Sol.

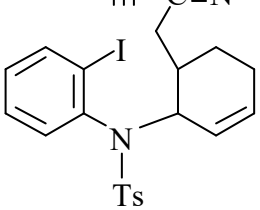


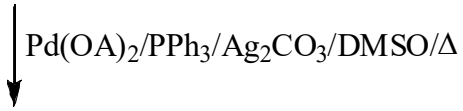


54Sol.

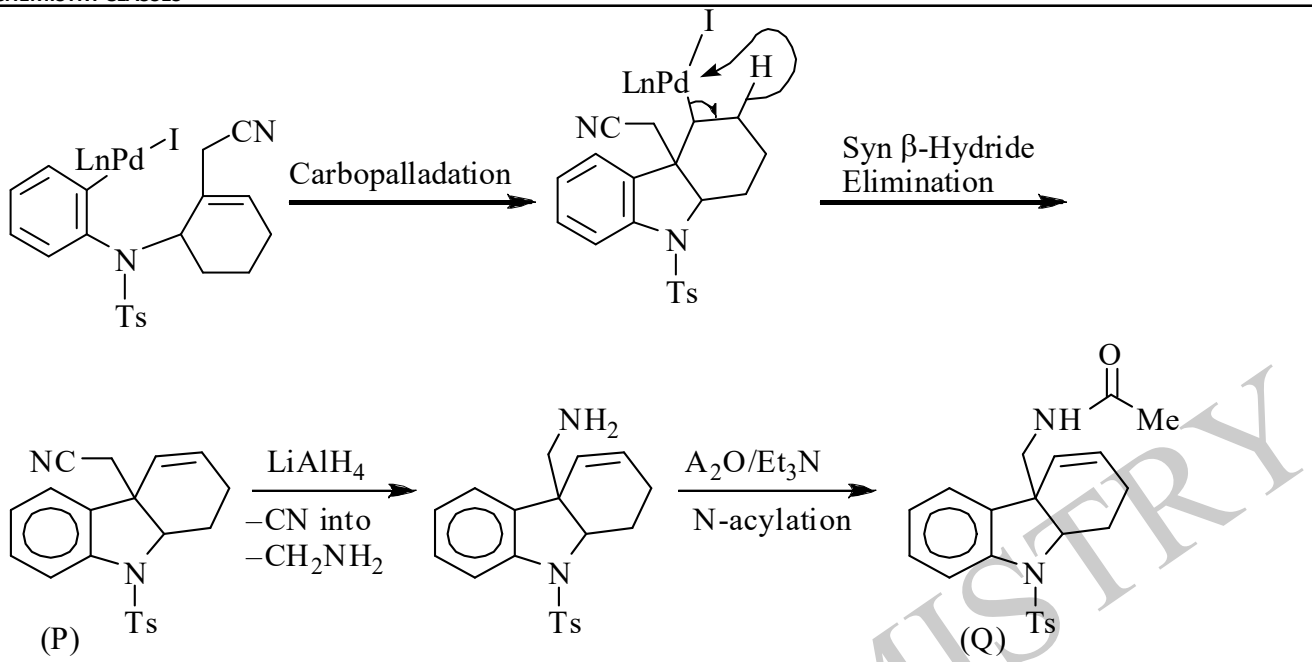


Intramoleculer Heck coupling with isomerigation of double bond



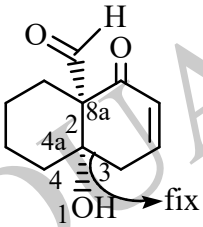


QUANTA CHEMISTRY CLASSES



GATE-**2020**

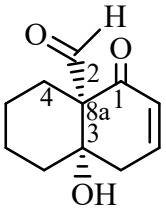
55Sol.:



Fix 3rd priority and rotate 1, 2 and 3.

$1 \rightarrow 2 \rightarrow 3$ (anticlockwise)

So, configuration of 4a centre is S.



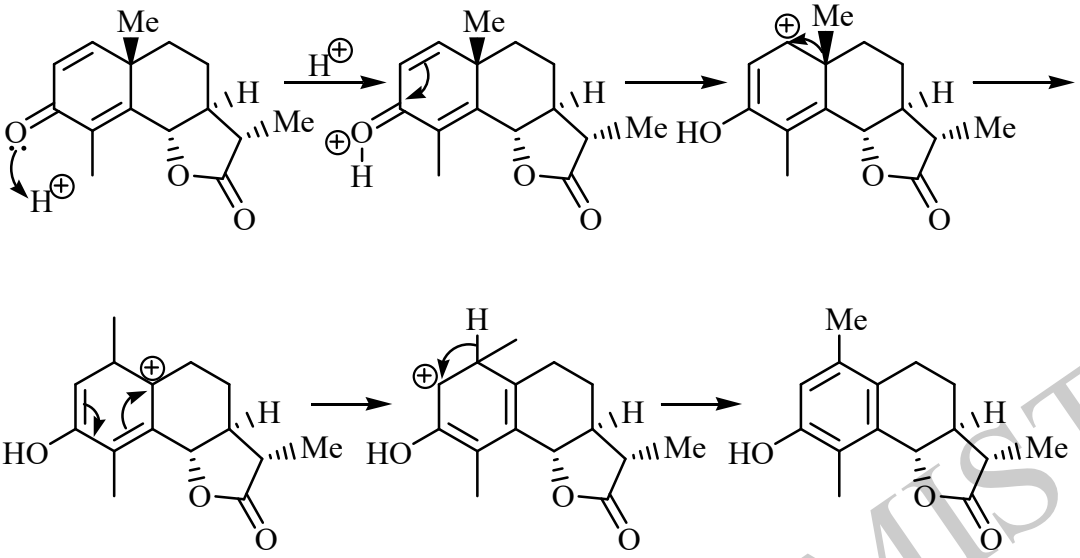
Similarly, here fix Ist priority and rotate 2, 3, 4

then rotate $1 \rightarrow 2 \rightarrow 3$ (clockwise)

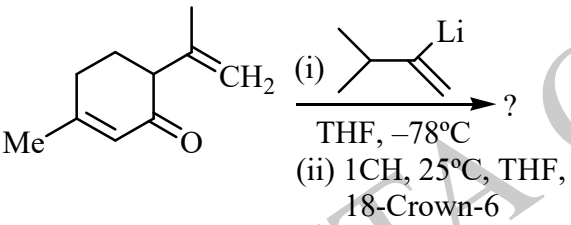
QUANTA CHEMISTRY CLASSES

So, configuration of 8a centre is R.

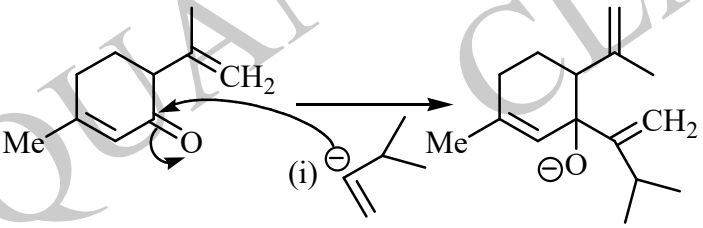
56Sol.:



57Sol.:

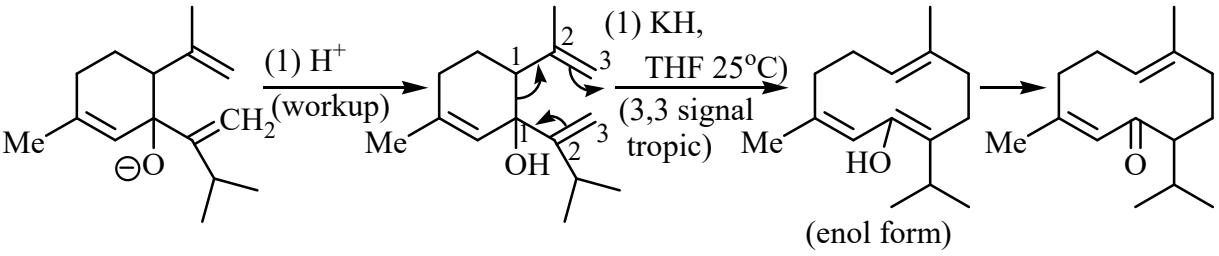


Step-(1)



sp^2 hybridised carbanion is a hard centre and attacks hard centre (i.e carboxyl group)

Step-(2)



Correct option is (a)

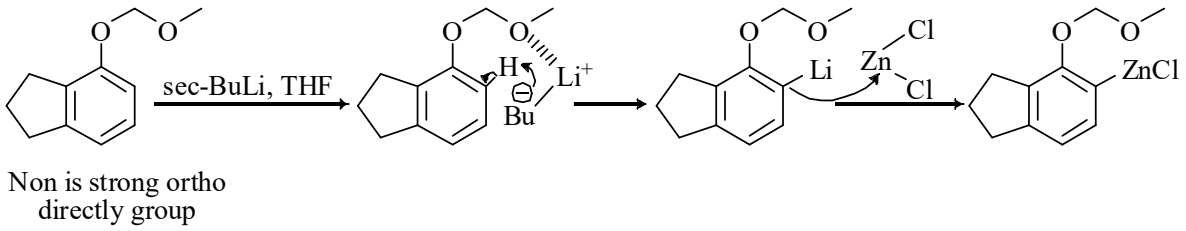
GATE-2021

QUANTA CHEMISTRY CLASSES

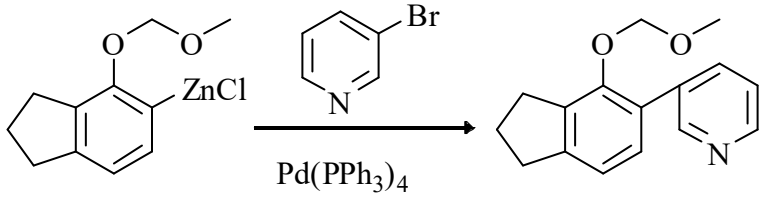
58. SOL

Non → sprotecting group

59Sol.



Non is strong ortho directly group



Correct option is (c)

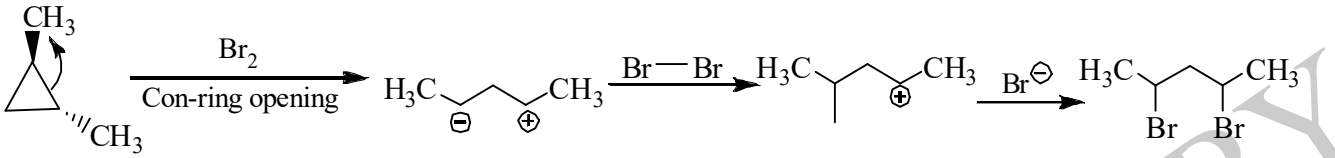
QUANTA CHEMISTRY CLASSES

INTERMEDIATE

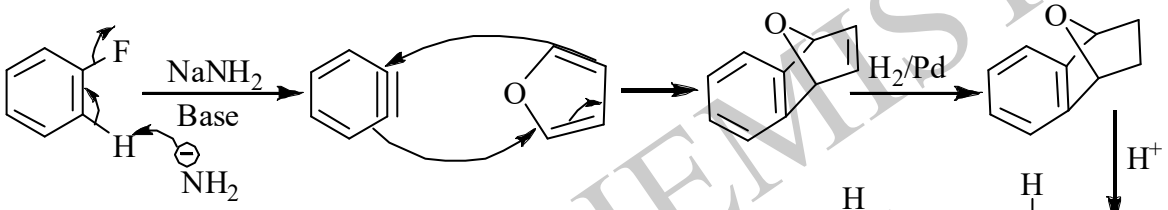
HINTS & SOLUTION

GATE-2005

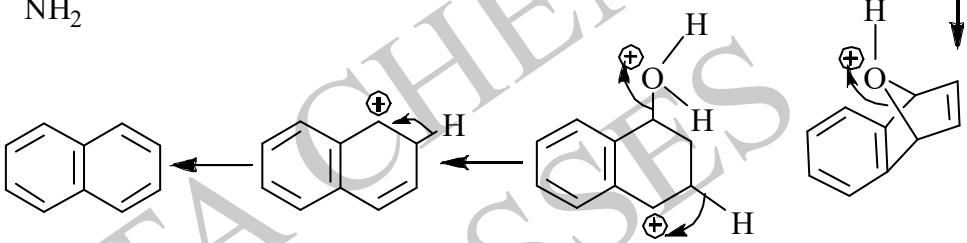
1.



Correct option is (d)

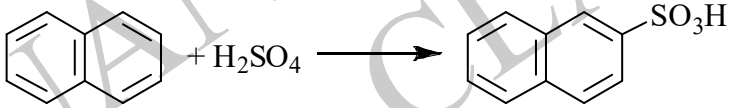


2. (a)



Correct option is (c)

(b)

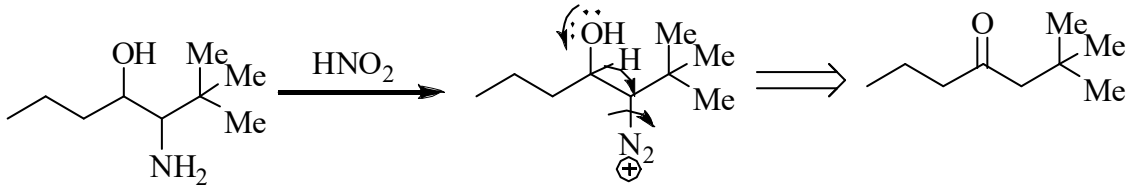


Thermodynamics control product
(More stable)

Correct option is (b)

GATE-2006

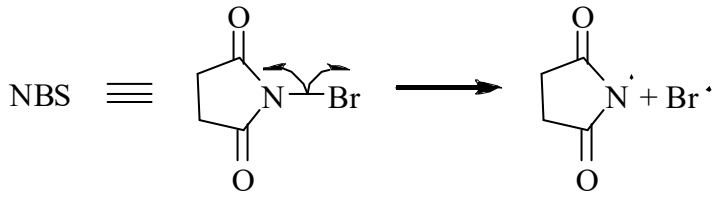
QUANTA CHEMISTRY CLASSES

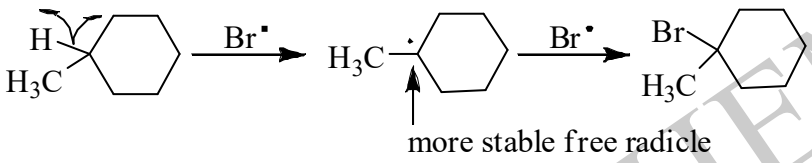
3. 

Correct option is (a)

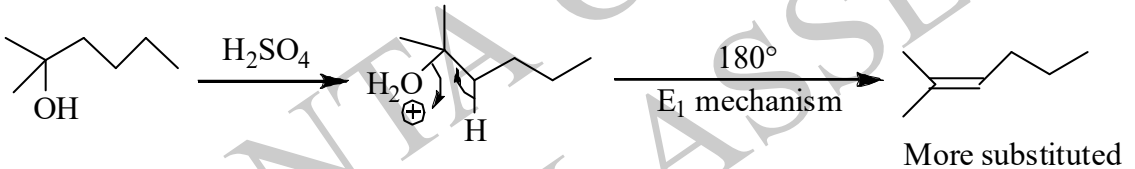
GATE-2007

4. NBS + AIBN ⟶ NBS in the presence of AIBN gives free radicle Br



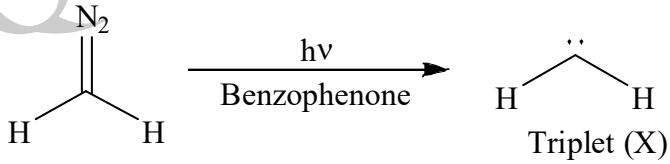


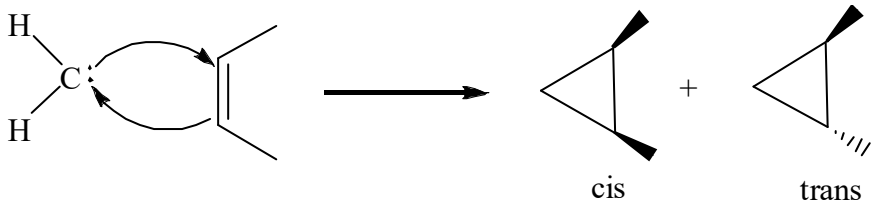
Correct option is (d)

5. 

Correct option is (c)

6. Photosensitized through benzophenone, produced triplet carbene (^{3}:CH_2)





Correct option is (d)

GATE-2008

7. Carbylamine reaction

QUANTA CHEMISTRY CLASSES

$CHCl_3 + KOH \longrightarrow : CCl_2$

Carbene

$$R-NH_2 \xrightarrow[\text{heat}]{CHCl_3/KOH} R-\overset{\oplus}{N}\equiv\overset{\ominus}{C} + 3KCl + 3H_2O$$

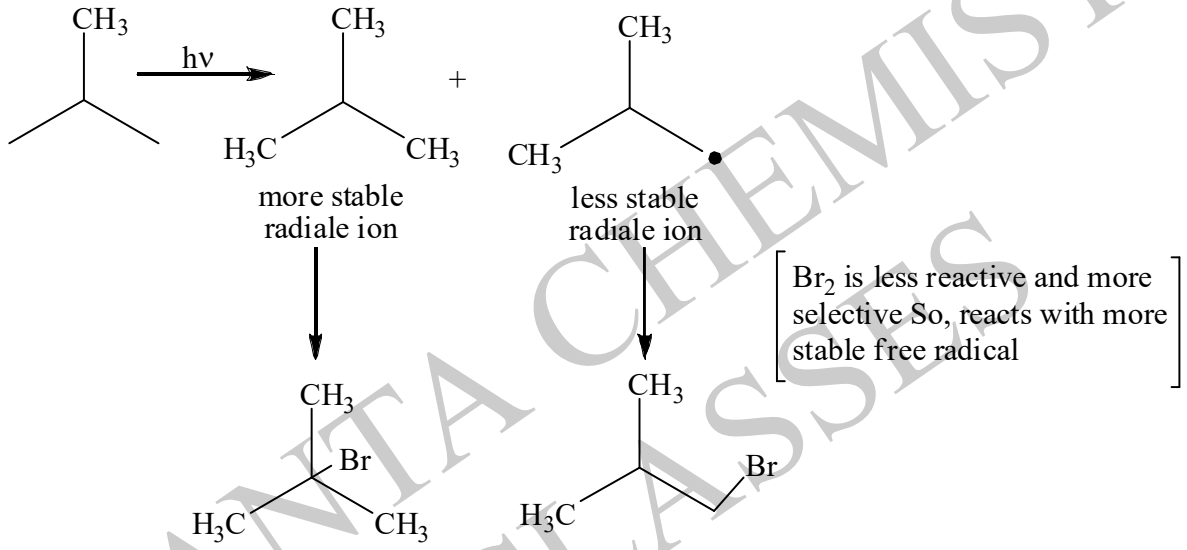
So, X = R – NH_2

Y = $R-N\equiv C$

Z = Carbene

Correct option is (a)

8. $Br - Br \xrightarrow{h\nu} 2Br^{\bullet}$

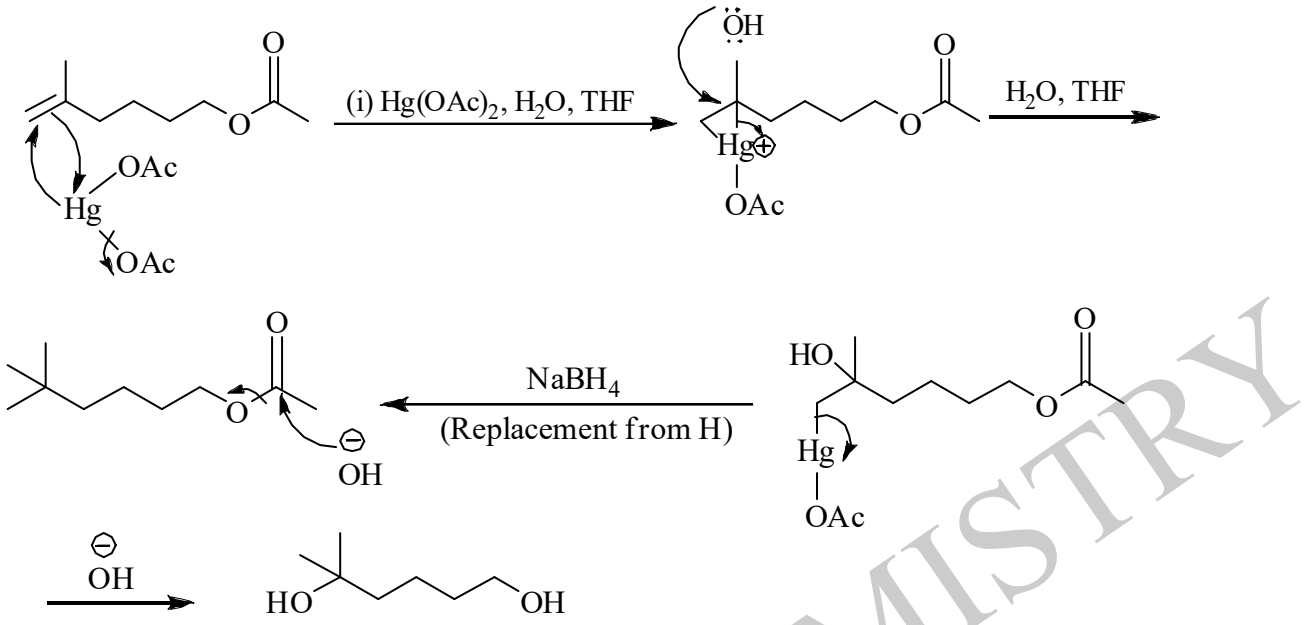


Ratio between 2-bromo-2-methyl propane and 1-bromo-2-methyl propane is 99 : 1

Correct option is (d)

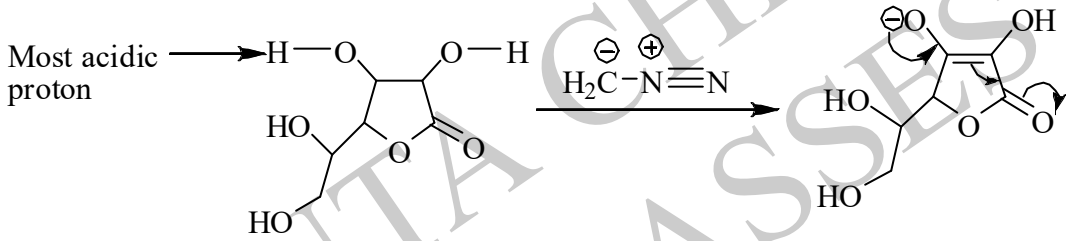
QUANTA CHEMISTRY CLASSES

9.



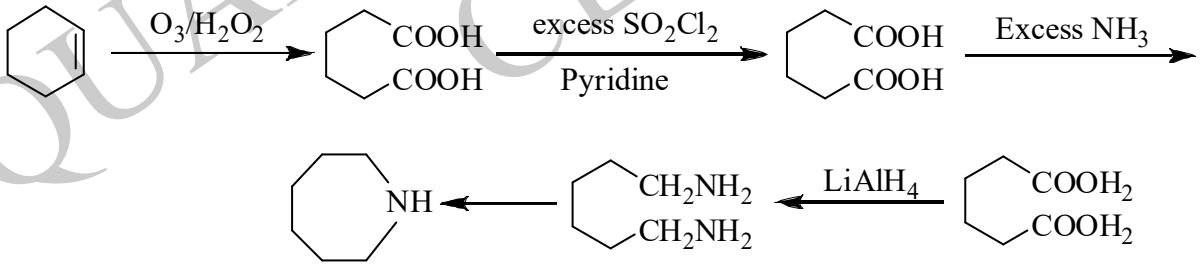
Correct option is (d)

10. Most acidic proton



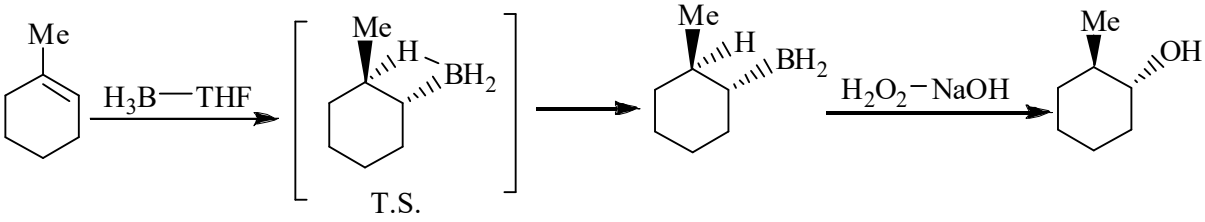
Correct option is (b)

11.



Correct option is (a)

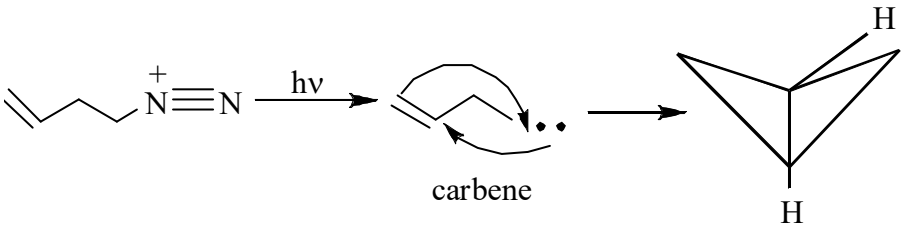
12.

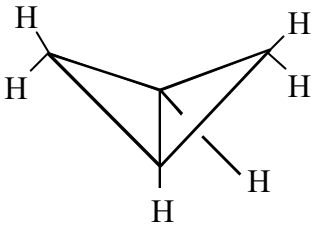


Correct option is (b)

QUANTA CHEMISTRY CLASSES

13.

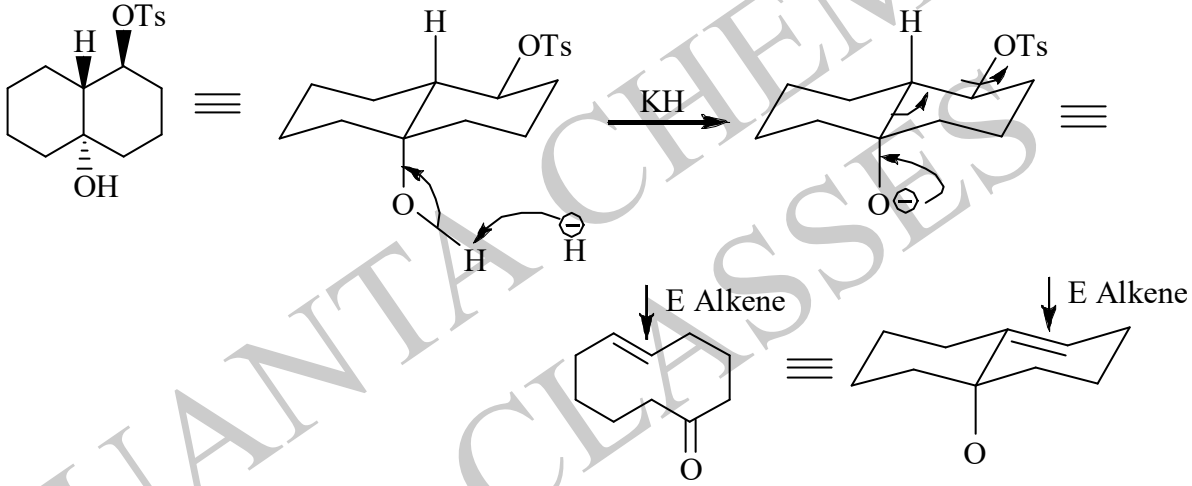


Product [P] 

Correct option is (a)

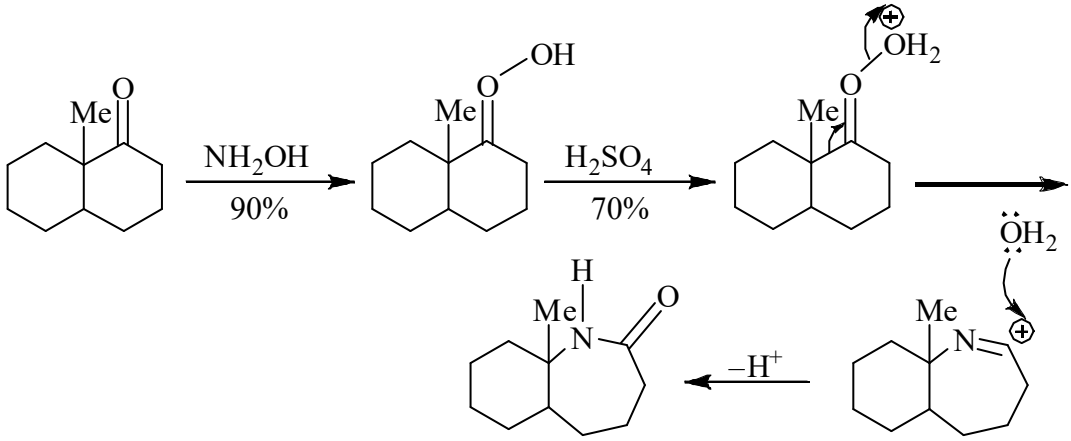
GATE-2009

14.



Correct option is (b)

15.



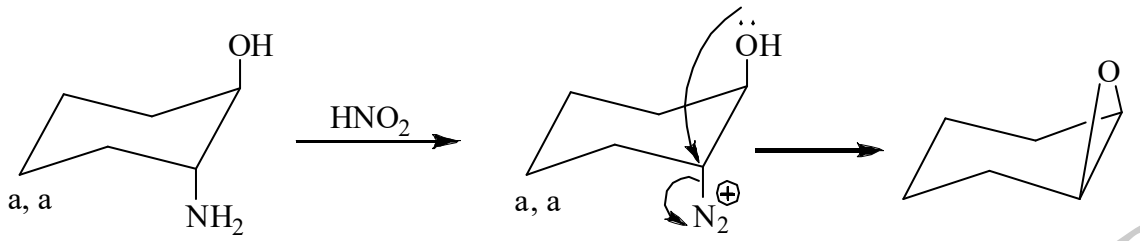
QUANTA CHEMISTRY CLASSES

$$\% \text{ yield} = \frac{90 \times 70}{100} = 63\%$$

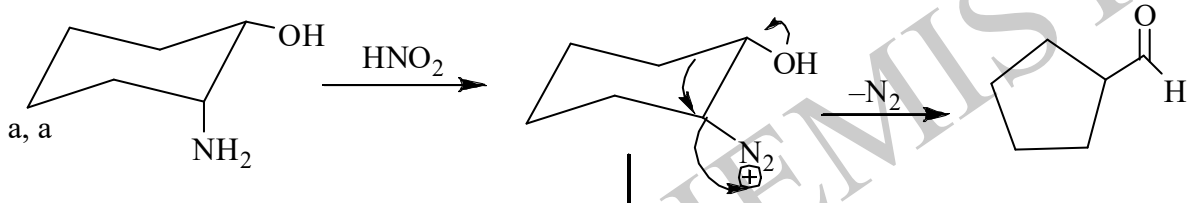
Correct option is (b)

GATE-2010

16.



One of the form of trans 2-amino cyclo hexanol.

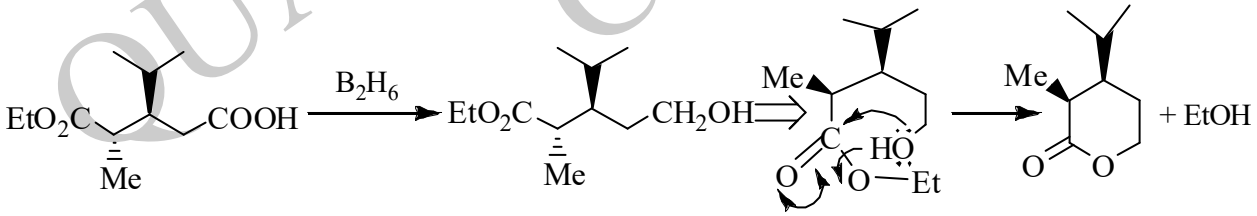


In this case methylene bond will migrate because it exhibit only diaxial relationship

Since, the conformation e, e is more stable.

Correct option is (b)

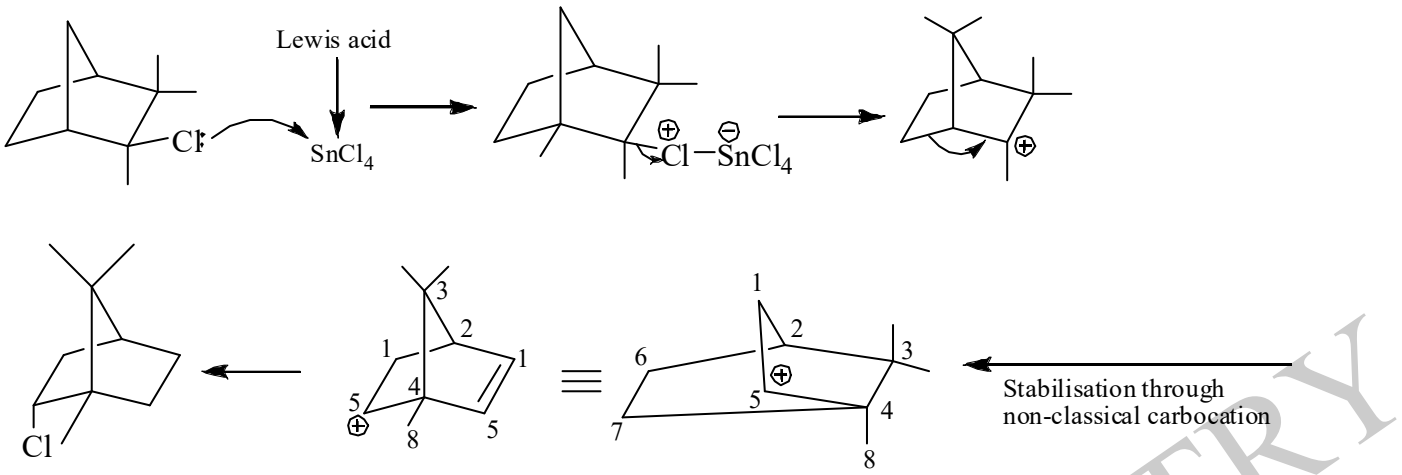
17.



Correct option is (b)

18.

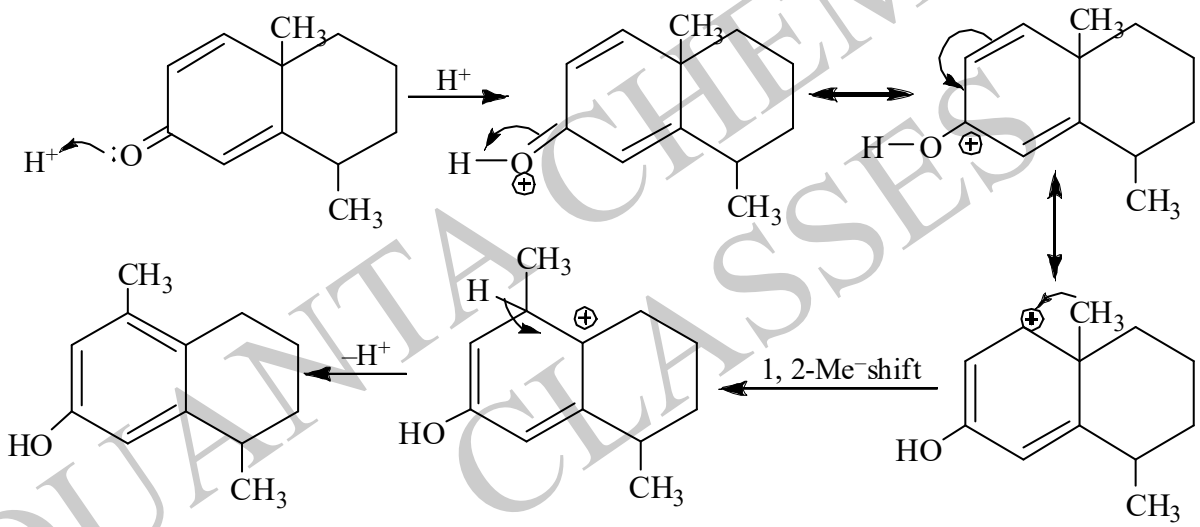
QUANTA CHEMISTRY CLASSES



Correct option is (b)

GATE-2011

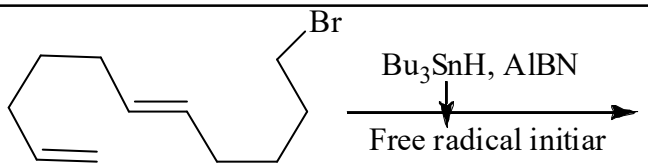
19.

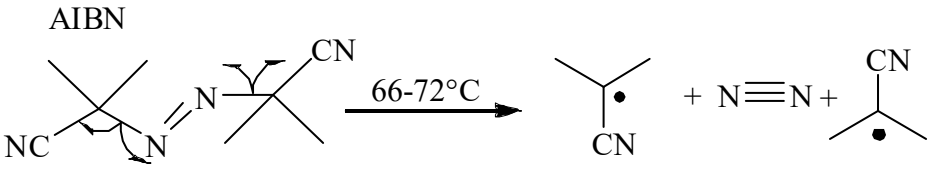


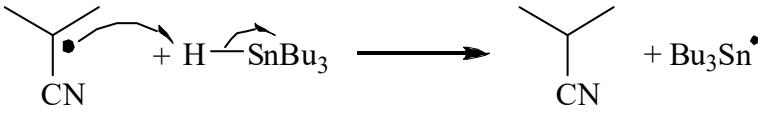
Correct option is (a)

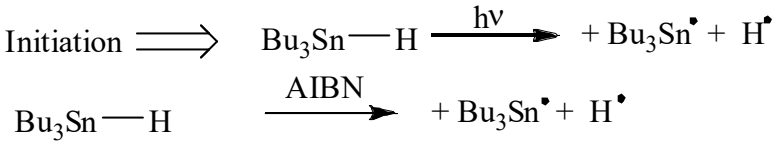
20.

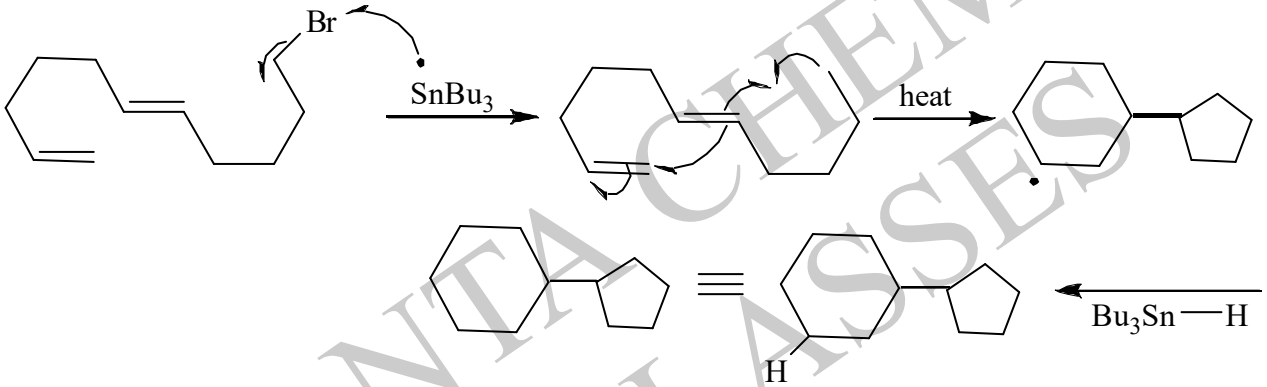
QUANTA CHEMISTRY CLASSES







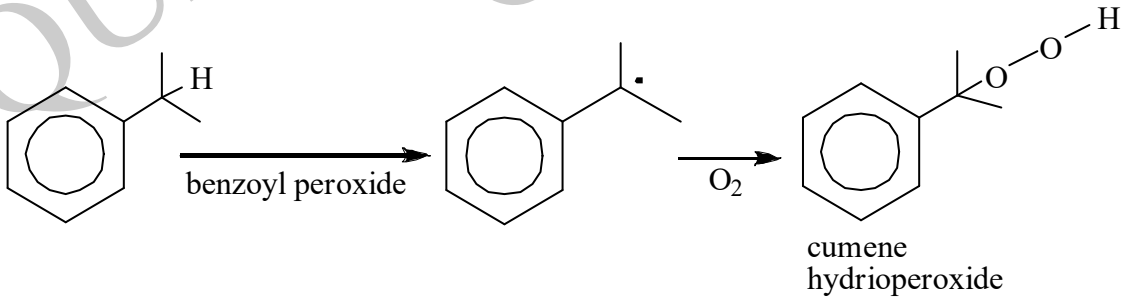




Correct option is (c)

GATE-2012

21.

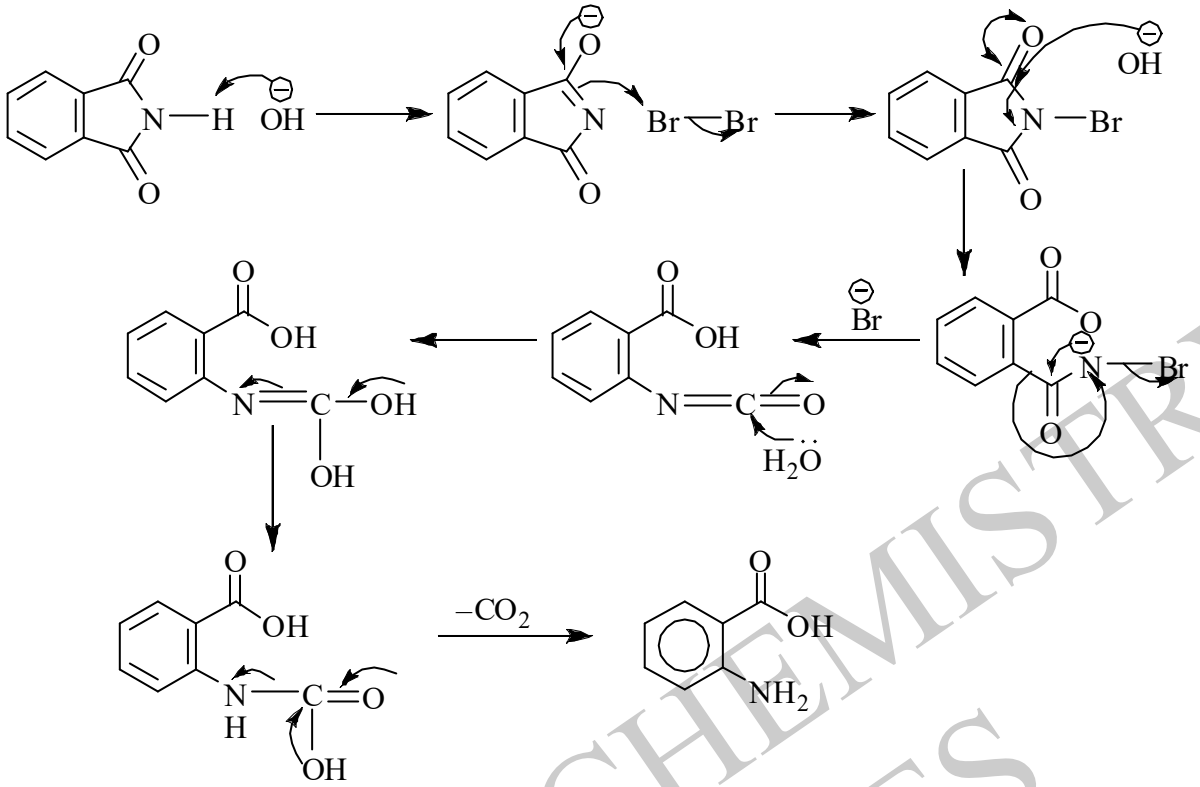


Correct option is (c)

GATE-2013

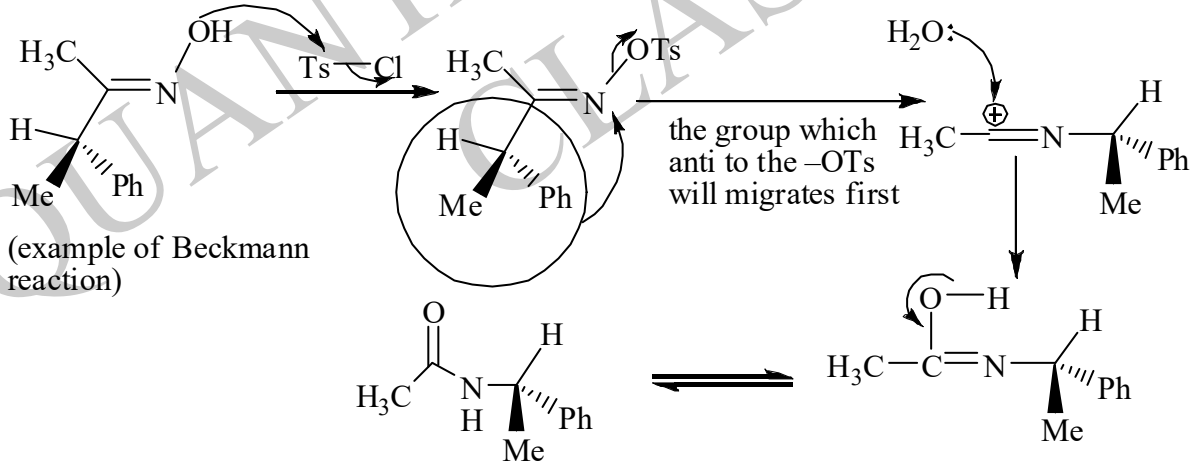
QUANTA CHEMISTRY CLASSES

22.



Correct option is (a)

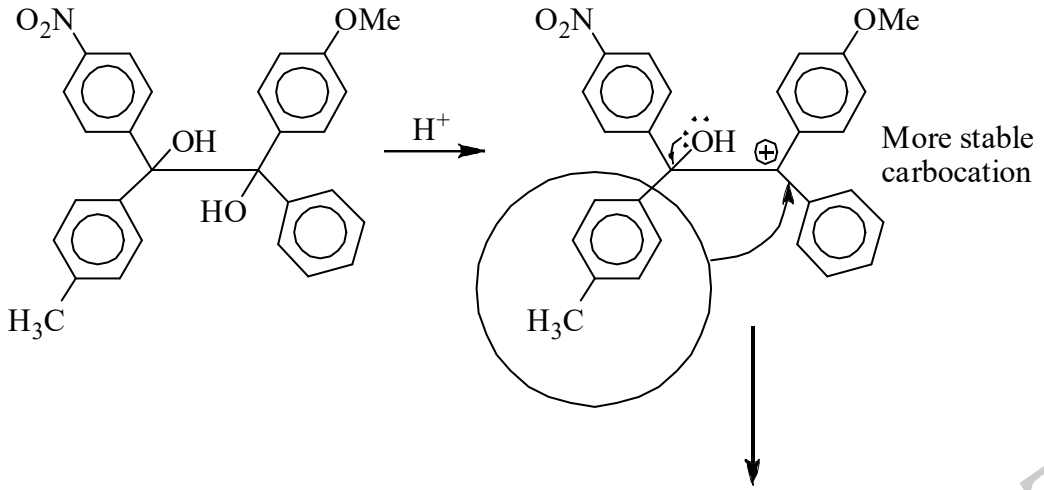
23.



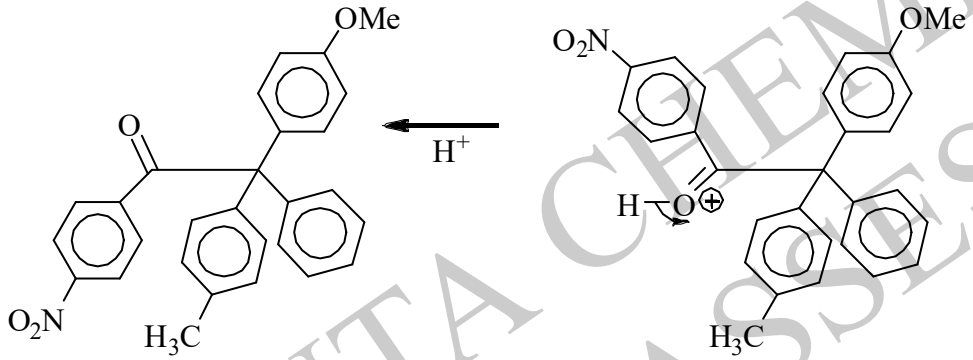
Correct option is (d)

QUANTA CHEMISTRY CLASSES

24.

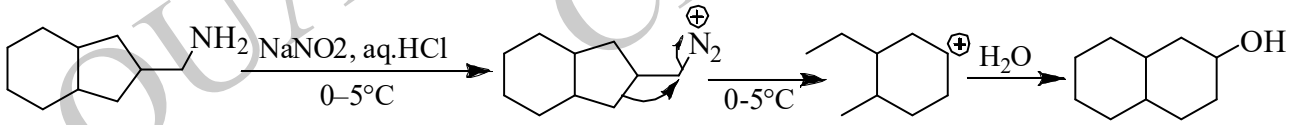


(Example of Pinacole-Pinacole rearrangement)



Correct option is (a)

25.

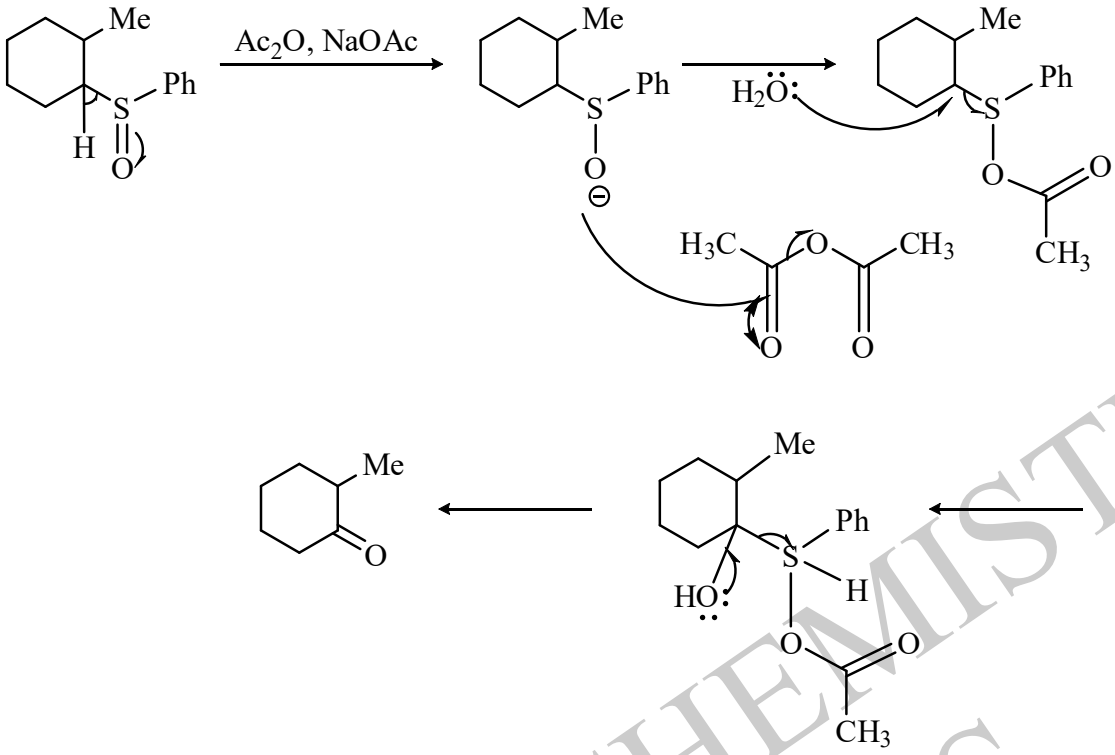


Correct option is (d)

GATE-2015

QUANTA CHEMISTRY CLASSES

26.



Correct option is (d)

GATE-2016

27.

(P) = Beckmann rearrangement

(Q) = Schimst reaction

Correct option is (b)

QUANTA CHEMISTRY CLASSES

QUANTA CHEMISTRY CLASSES

8

SPECTROSCOPY

HINTS & SOLUTION

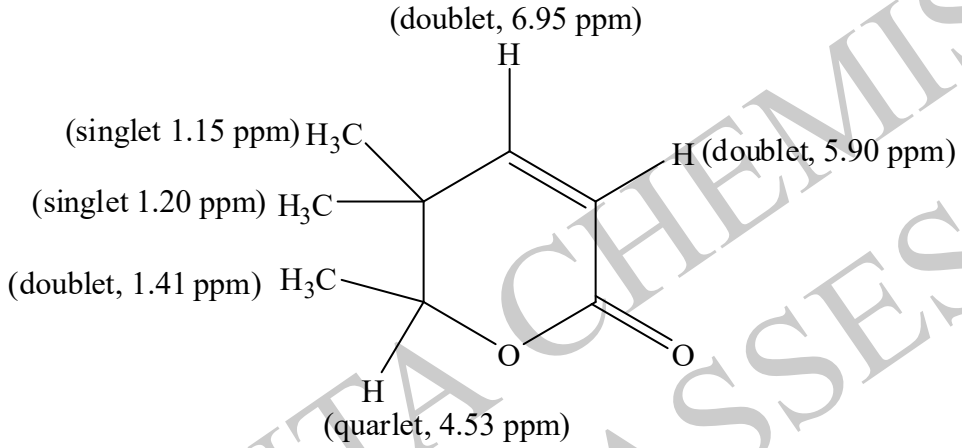
GATE-2005

1. ^1H NMR spectrum of [18]-annulene shows two peaks a δ 9.0 (12 H) and δ-3.0 (6 H)
   Correct option is (c)

2. Molecular formula $C_8H_{12}O_2$

$$\text{DBE} = C_{n-1}\frac{\text{monovalent}}{2}\ C_{n-1}\frac{\text{monovalent}}{2} + 1 = 8 - \frac{12}{2} + 1 = 8 - 6 + 1 = 0$$

[one ring + two double bond]

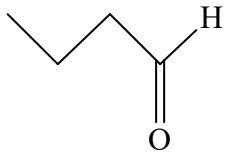


IR : 1720 cm–1 (lactone) cyclic ester
Correct option is (c)

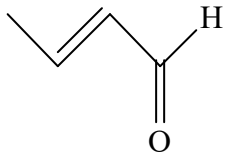
GATE-2006

QUANTA CHEMISTRY CLASSES

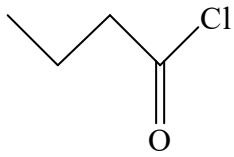
3.



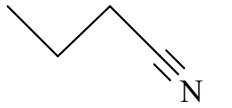
→ 1725 cm^{-1}



→ 1695 cm^{-1}



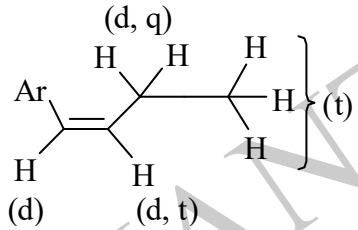
→ 1795 cm^{-1}



→ 2240 cm^{-1}

Correct option is (c)

4.

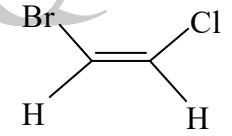


J value of cis-Hs = 10 Hz

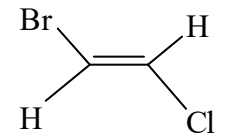
Correct option is (d)

GATE-2007

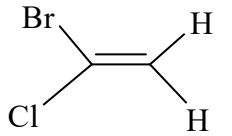
5.



Coupling constant around ~ 10 Hz



Coupling constant around ~ 15 Hz



Coupling constant around ~ 1 Hz

Correct option is (b)

QUANTA CHEMISTRY CLASSES

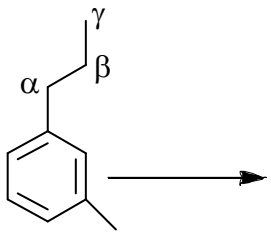
6. $\sigma - \sigma^* \longrightarrow C - C$

$n - \sigma^* \longrightarrow C - O$

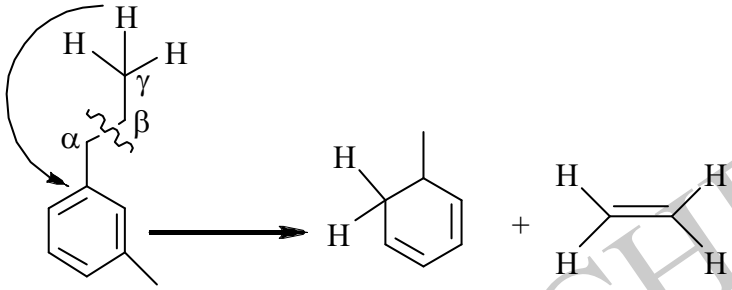
$n - \pi^* \longrightarrow C = O$

$\pi - \pi^* \longrightarrow C = C$

Corret option is (a)

7. 

α hydrogen present. So, given base peak in mass spectrum via Mc-lafferty fragment

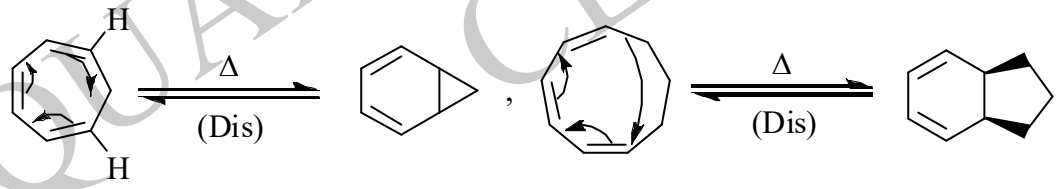


In $P \rightarrow$ no γ hydrogen

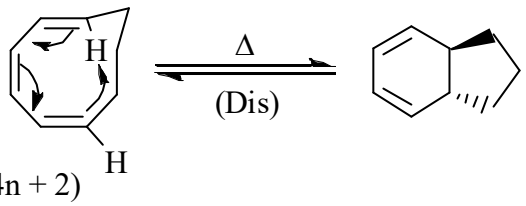
In $R \rightarrow$ no γ hydrogen

In $S \rightarrow$ no γ hydrogen

Correct option is (b)

8. 

(4n + 2) (4n + 2)



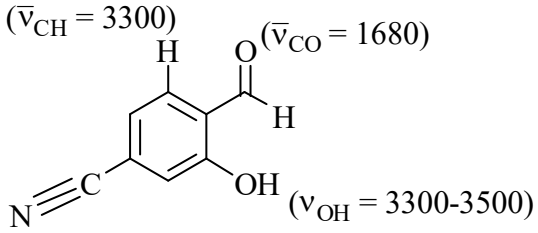
(4n + 2)

Correct option is (a)

GATE-2008

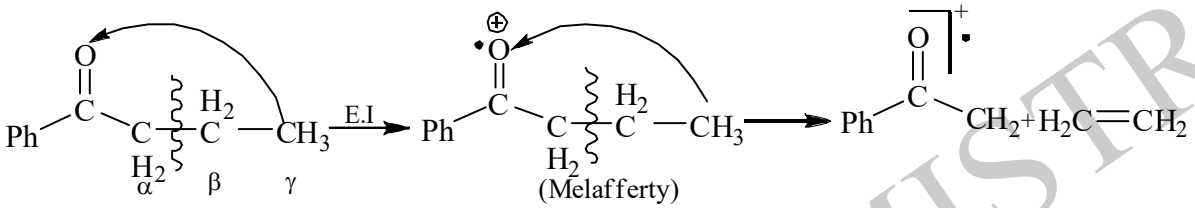
QUANTA CHEMISTRY CLASSES

9.



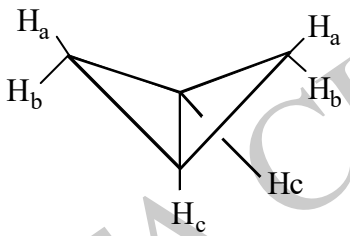
Correct option is (a)

10.



Correct option is (d)

11. Product [P] ⟶



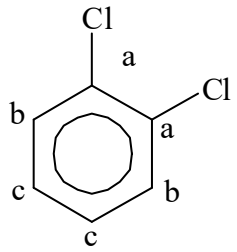
^{1}H NMR signal $\rightarrow$3 ^{13}C NMR signal = 2

Correct option is (a)

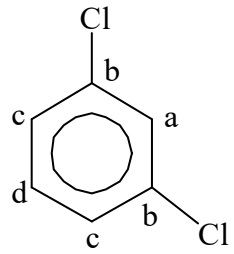
GATE-2009

QUANTA CHEMISTRY CLASSES

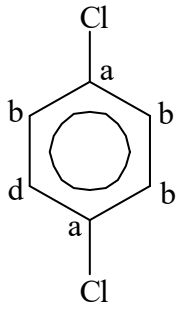
12.



⟶ 3 signals in ^{13}CNMR



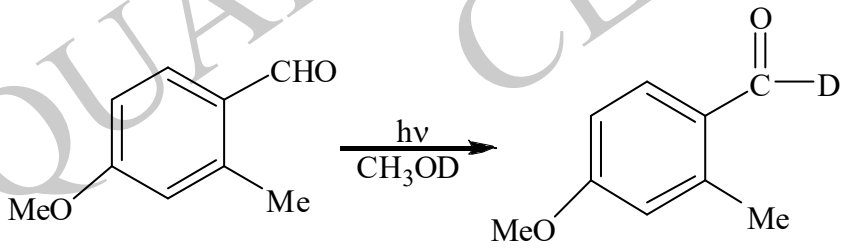
⟶ 4 signals in ^{13}CNMR



⟶ 2 signals in ^{13}CNMR

Correct option is (a)

13.



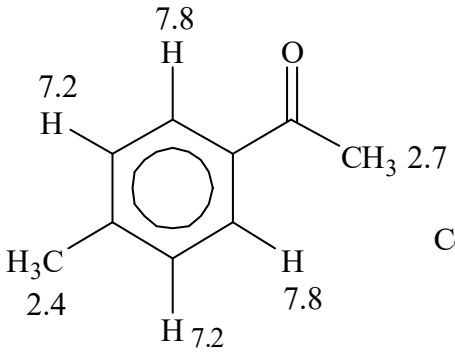
The signal of –CHO proton disappear at 9.7 ppm

Correct option is (a)

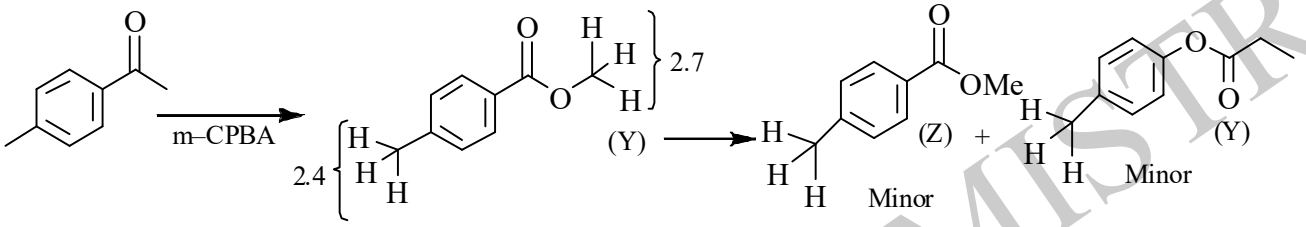
14. $\text{DBE} = C_9H_{10}O;\ \text{Cn} - \dfrac{\text{monovalent}}{2} + 1 \Rightarrow 9 - \dfrac{10}{2} + 1 \Rightarrow 9 - \dfrac{5}{5} + 1$

5(one ring + 4 double bond)

QUANTA CHEMISTRY CLASSES

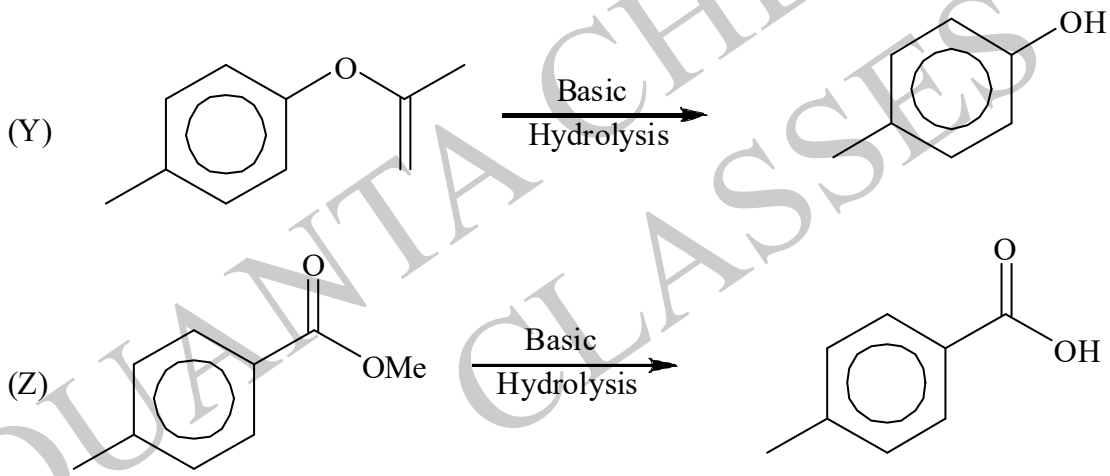


Compound (X)



Correct option is (b)

15.



Correct option is (b)

GATE-2010

16. The effective magnetic moment ~ 5.9 B.M. means it has 5 unpaired electron, Mn(II) and Fe(III) both contains five unpaired electron and both are ESR active (due to presence of unpaired electrons) in 3d-series only Fe, Ni, Zn are Mossbauer active elements. So, Fe(II) is the element which are ESR and Mossbauer active

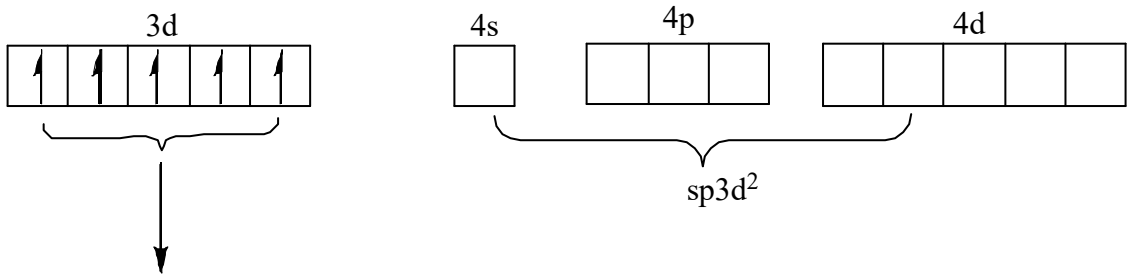
Correct option is (d)

17. $[Fe(H_2O)_6]^{3+}$

$Fe = 3d^6\ 4s^2$

$Fe^{3+} = 3d^5$

QUANTA CHEMISTRY CLASSES

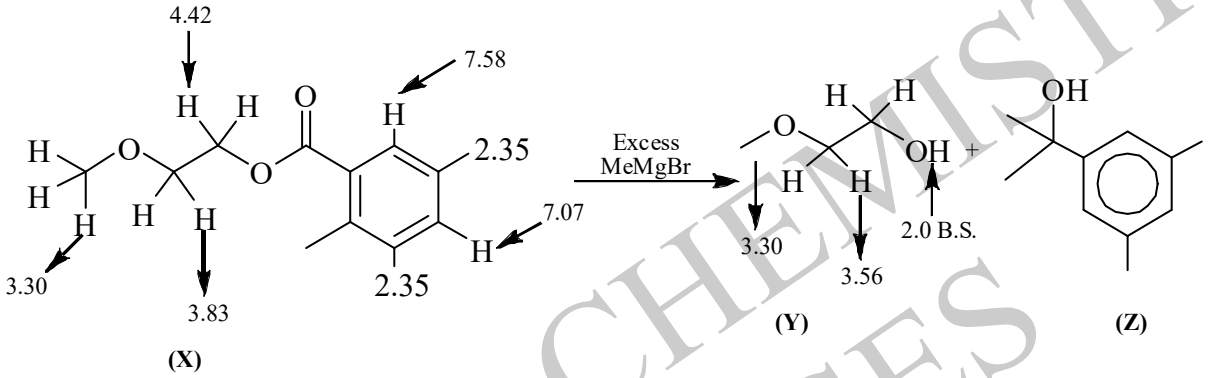


Five unpaired electron

Five unpaired electron

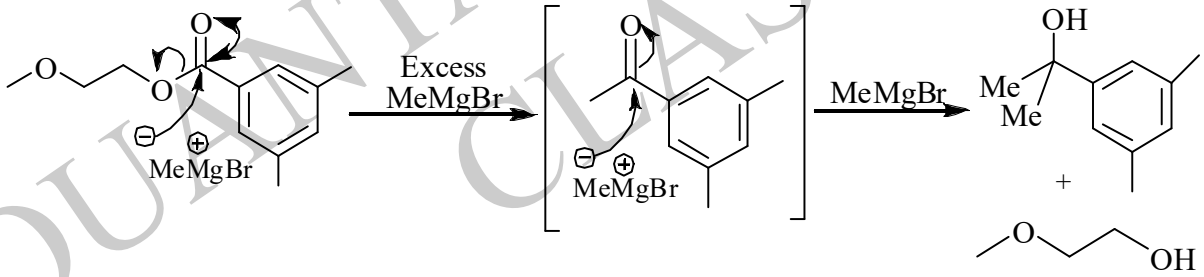
Correct option is (d)

18.



Correct option is (b)

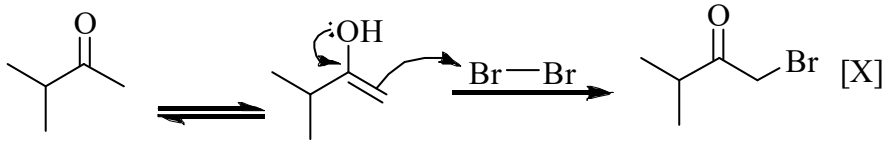
19.



Correct option is (b)

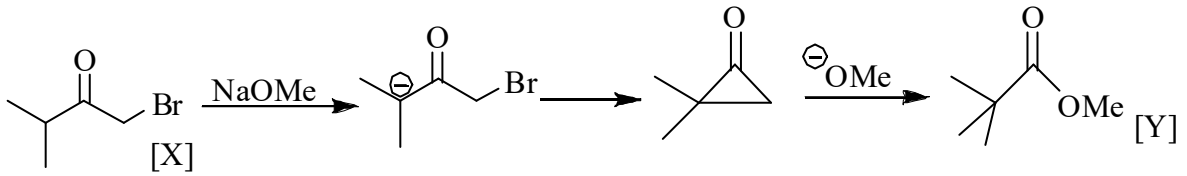
GATE-2011

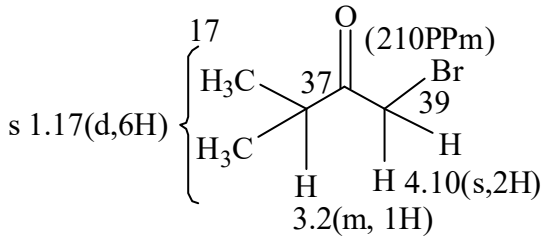
20.



Correct option is (d)

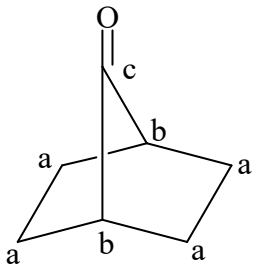
QUANTA CHEMISTRY CLASSES

21. 

[X] = 

Correct option is (b)

GATE-2012

22. 

total number of signal in ^{13}C NMR = 3

Correct option is (b)

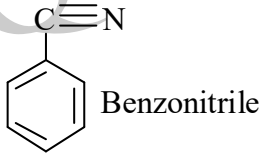
23. In CH_3Br molecule Br having two isotope ^{79}Br and ^{81}Br

CH_3Br^{79} : CH_3Br^{81}

$M^+ : (M+2)^+ = 1 : 1$

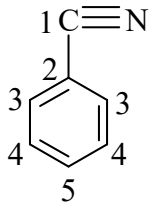
Correct option is (c)

GATE-2013

24. 

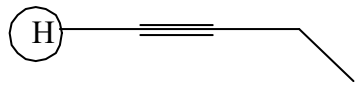
Benzonitrile

So, the pronton decopled ^{13}C NMR is 5.



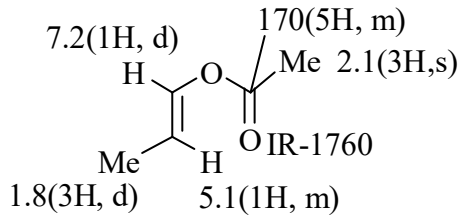
Correct option is (5 to 5)

QUANTA CHEMISTRY CLASSES

25. 

ν_{C-H} = 3300 cm^{-1}

Correct option is (c)

26. 

Correct option is (a)

GATE-2014

27. Increasing in the size decreasing IR (C = C) streching frequency)

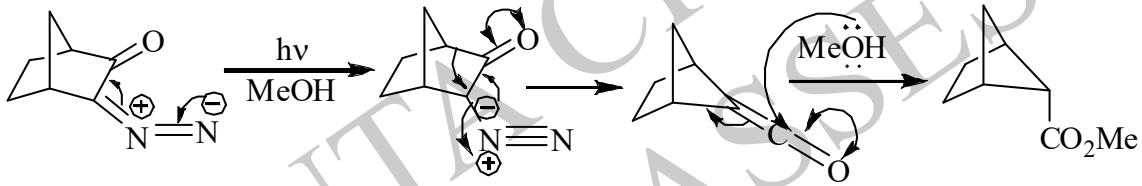
(III) > (II) > I

Correct option is (c)

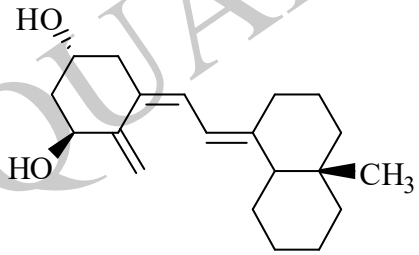
28. $CH_3\mathbf{CH}_2CH_2OCH_3$

The underlined proton shows different signal in NMR at 500 MHz and 60 mHz

Correct option is (b)

29. 

Correct option is (c)

30. 

Basic value – 217 nm

additional conjugational – 30 nm

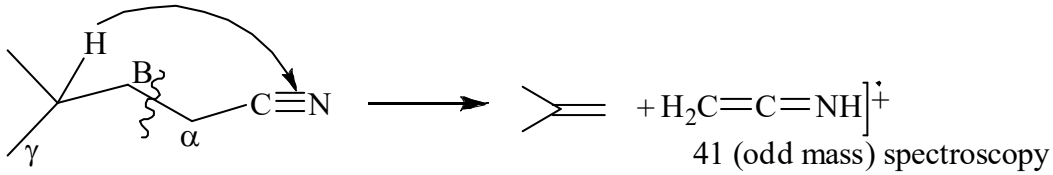
4 alkyl group – 20 nm

3 excoyclic bond = 15

282 nm

Correct option is (282)

QUANTA CHEMISTRY CLASSES

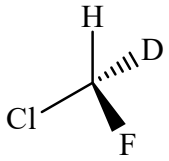
31. 

41 (odd mass) spectroscopy

as (41 to 41)

Correct option is (41)

GATE-2016

32. 

multiplicity $[2NI_F + 1]\,[2NI_D + 1]$

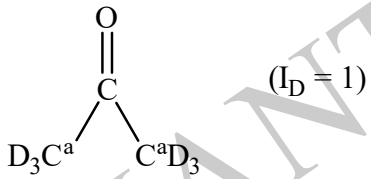
$I_D = 1;\ I_F = \frac{1}{2}$

$\Rightarrow \left[2\times1\times\frac{1}{2}+1\right][2\times1\times1+1] \Rightarrow 2 \times 3 = 6$ (Line)

Correct answer is (6)

GATE-2017

33. acetone-d_6



$(I_D = 1)$

multiplicity $\rightarrow (2NI + 1)$

$\rightarrow (2 \times 3 \times 1 + 1)$

$\rightarrow 7$ (septet)

I = 3 (Non pascal)

Intensity pattern

↓

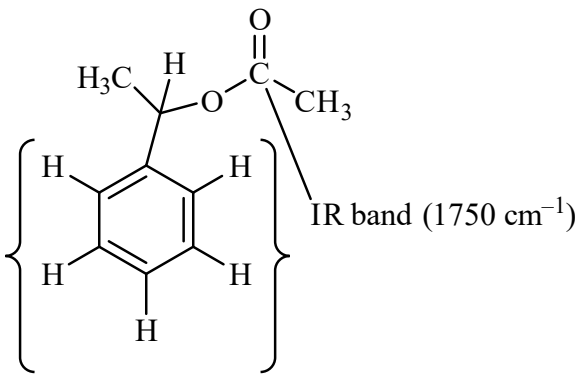
1 : 3 : 6 : 7 : 6 : 3 : 1

Correct option is (b)

34. 1-(phenyl ethyl) acetate

1.5 (d3H, J = 7.2Hz) 5.85 (q1H.J = 72)

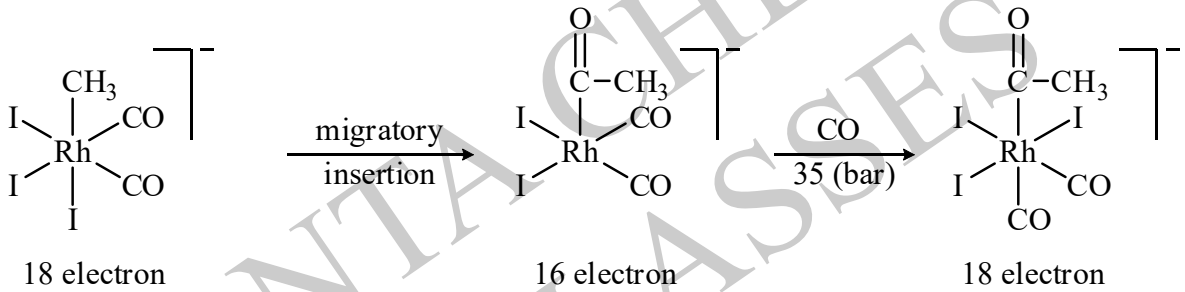
QUANTA CHEMISTRY CLASSES



s 7.3 multiple 5H

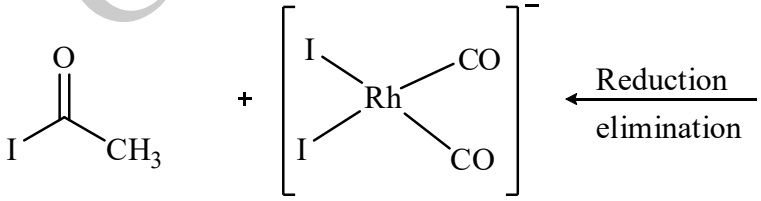
Correct option is (b)

GATE-2018



18 electron 16 electron 18 electron

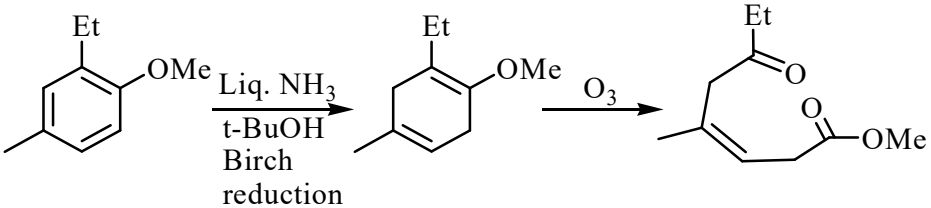
35.



Correct option is (c)

GATE-2020

36Sol.:

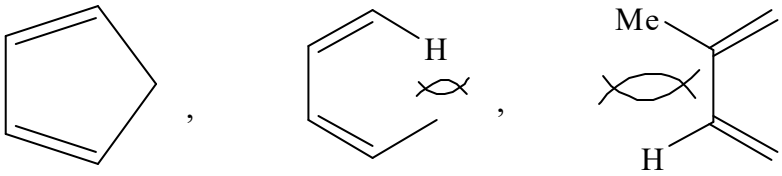


QUANTA CHEMISTRY CLASSES

PERICYCLIC REACTIONS & PHOTOCHEMISTRY

HINTS & SOLUTION

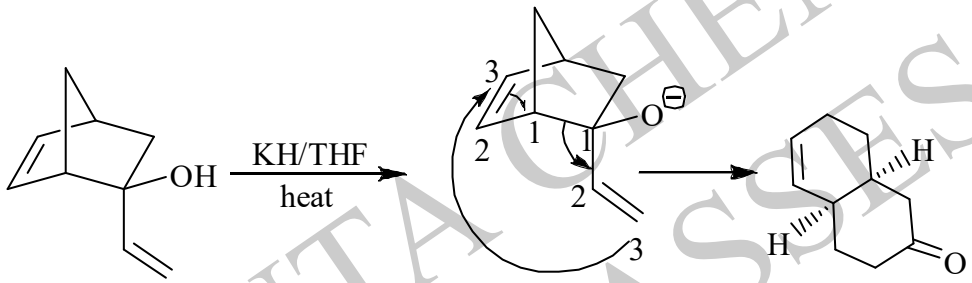
GATE-2005

1. 

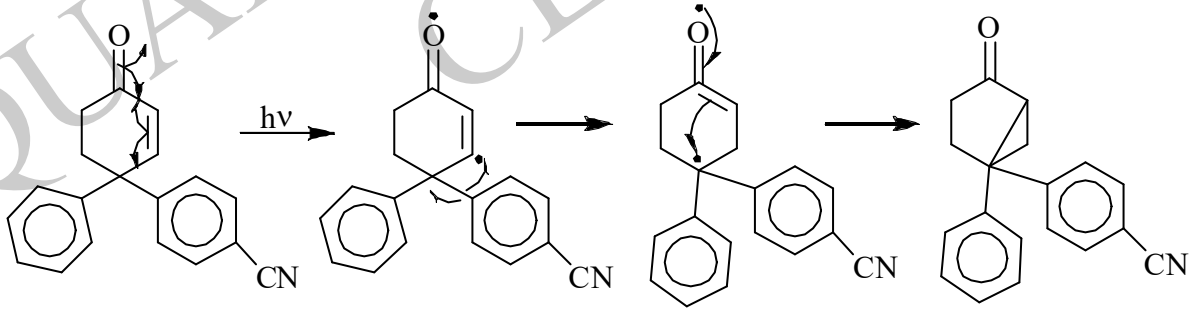
Rigid system (cisoid) (x) | More repulsion (y) | (z)

Order of reactivity x > z > y

correct option is (a)

2. 

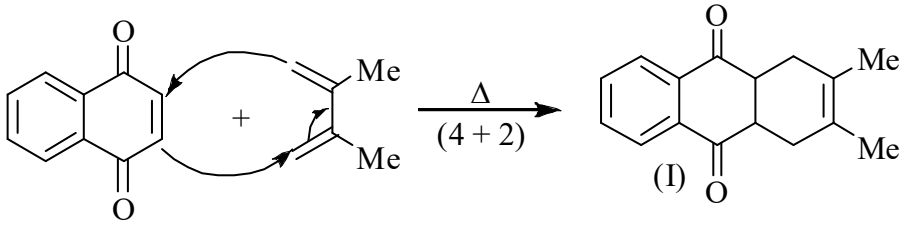
Correct option is (d)

3. 

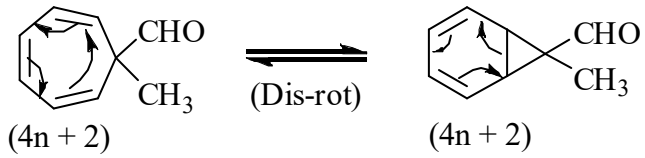
Correct option is (b)

GATE-2006

QUANTA CHEMISTRY CLASSES

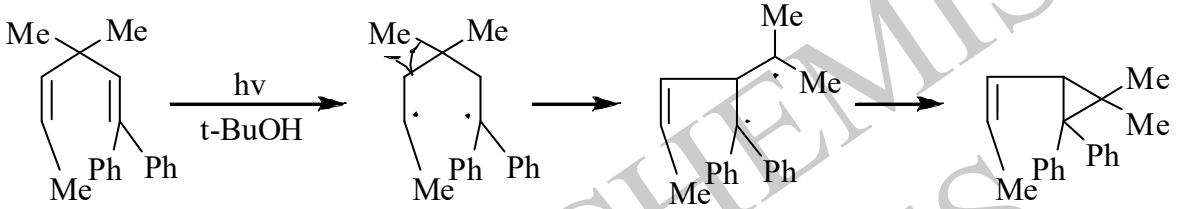
4. 

Correct option is (d)

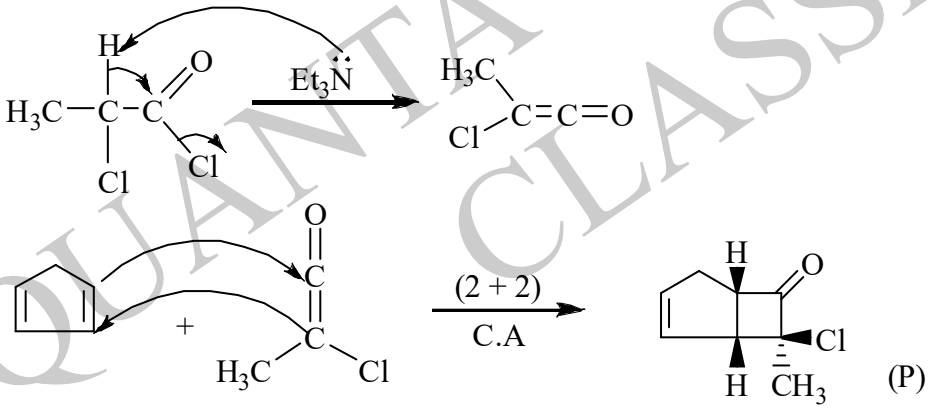
5. 

Movement of electron only without the moment of atoms is called valence isomerization

Correct option is (c)

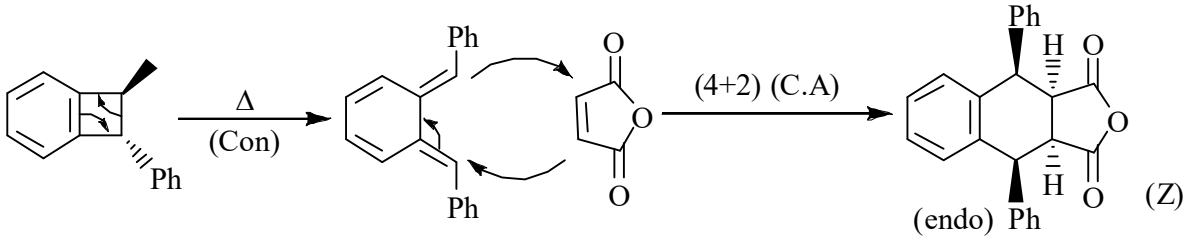
6. 

Correct option is (a)

7. 

Correct option is (c)

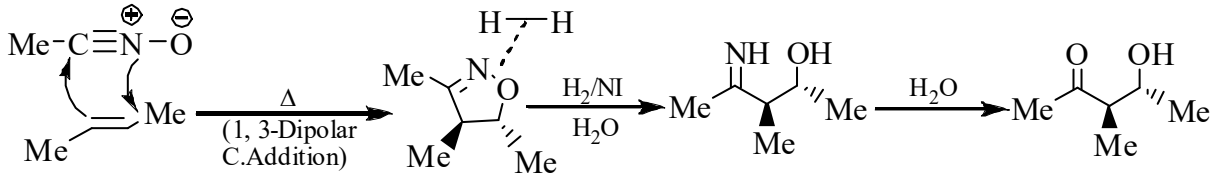
GATE-2008

8. 

Correct option is (a)

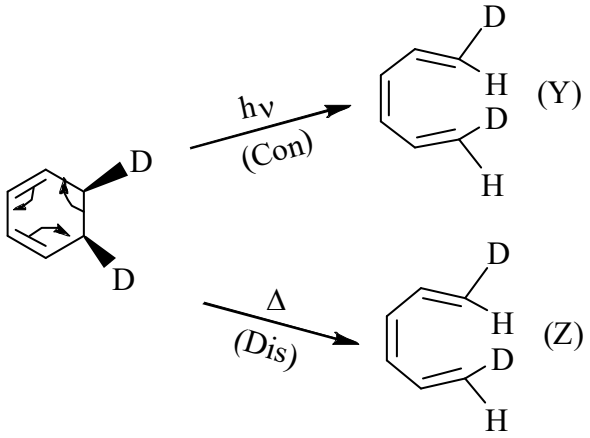
QUANTA CHEMISTRY CLASSES

9.



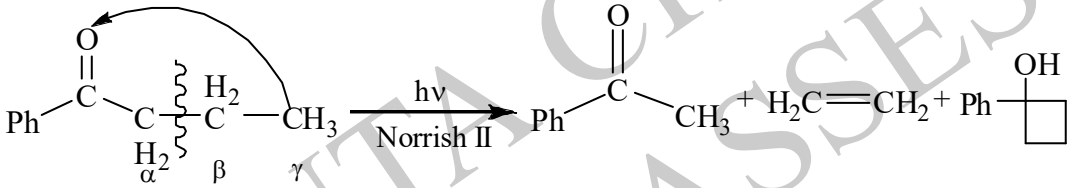
Correct option is (b)

10.



Correct option is (a)

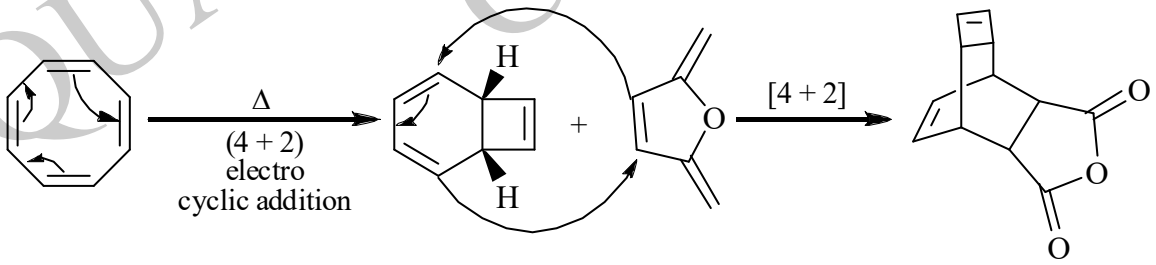
11.



Correct option is (d)

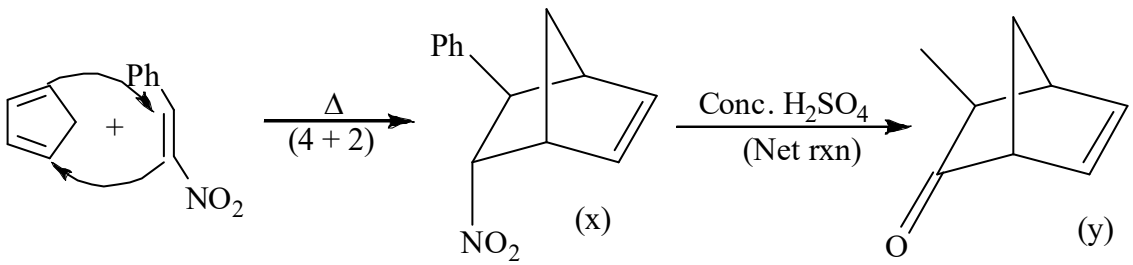
GATE-2009

12.



Correct option is (b)

13.

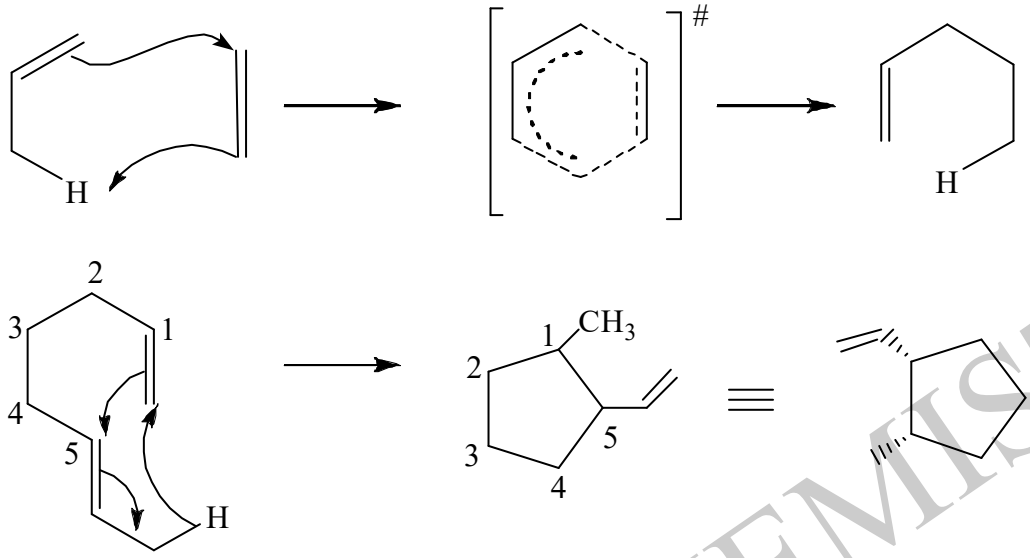


QUANTA CHEMISTRY CLASSES

Correct option is (b)

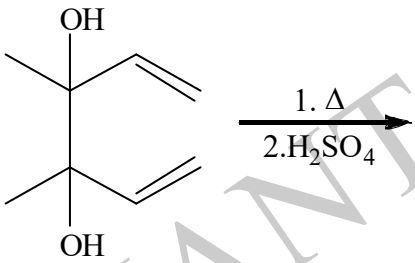
GATE-2010

14. It is an example of ene reaction.

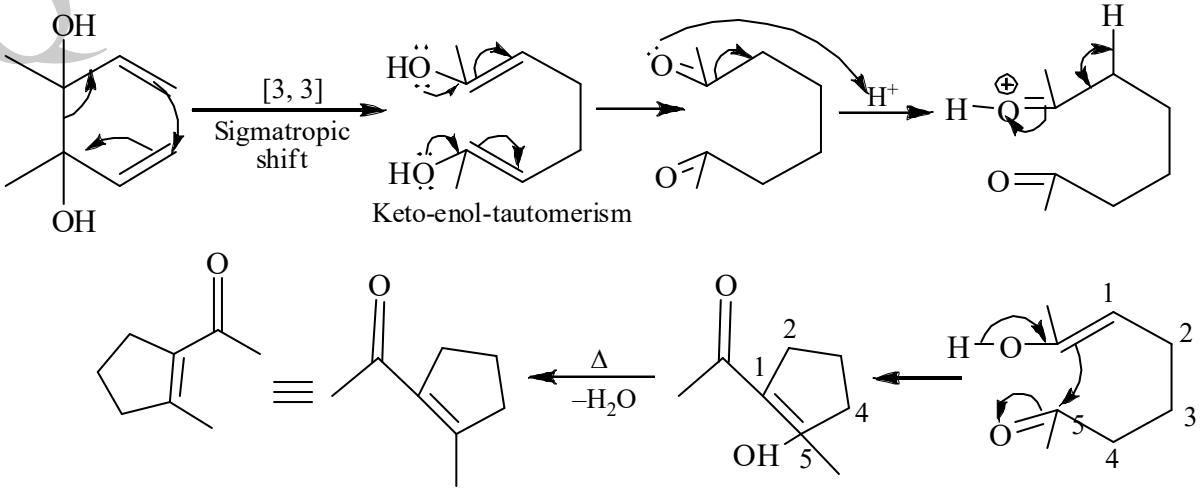


Correct option is (a)

15.



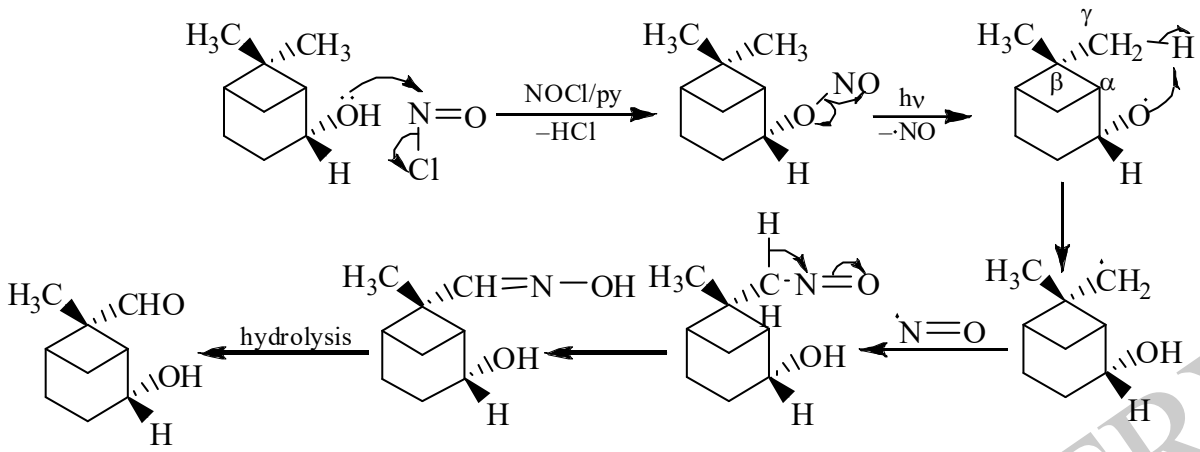
It is an example of oxy cope rearrangement.



Correct option is (a)

QUANTA CHEMISTRY CLASSES

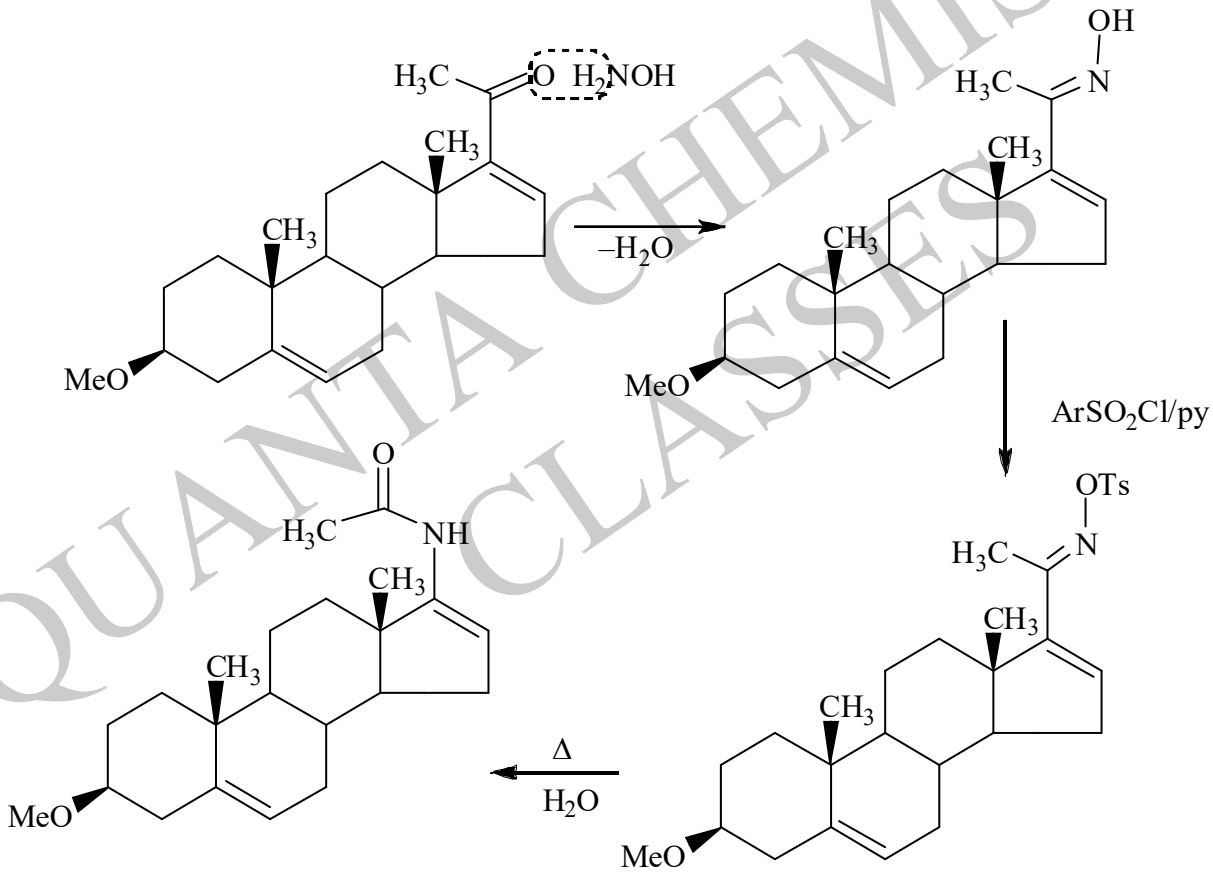
16.



Correct option is (c)

GATE-2011

17.

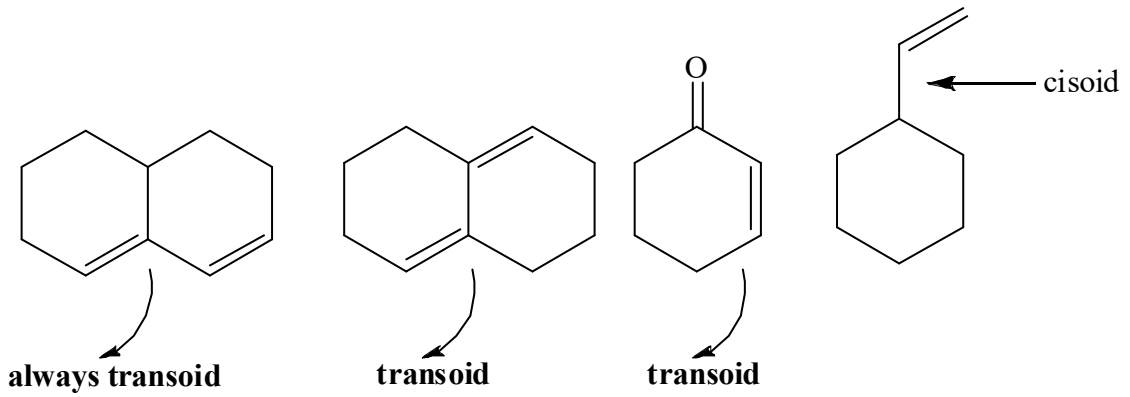


Beckmann arrangement

Correct option is (a)

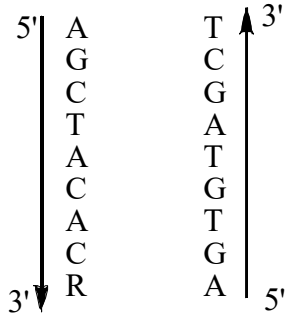
QUANTA CHEMISTRY CLASSES

18.



Correct option is (a)

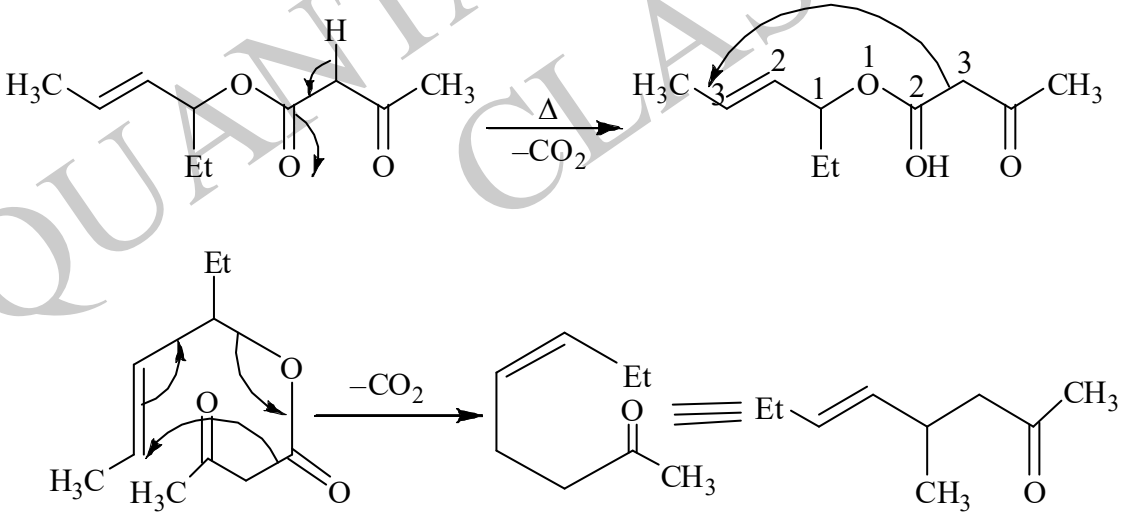
19.



Because base pairing between
$A \rightarrow T$
$G \rightarrow C$

Correct option is (c)

20.

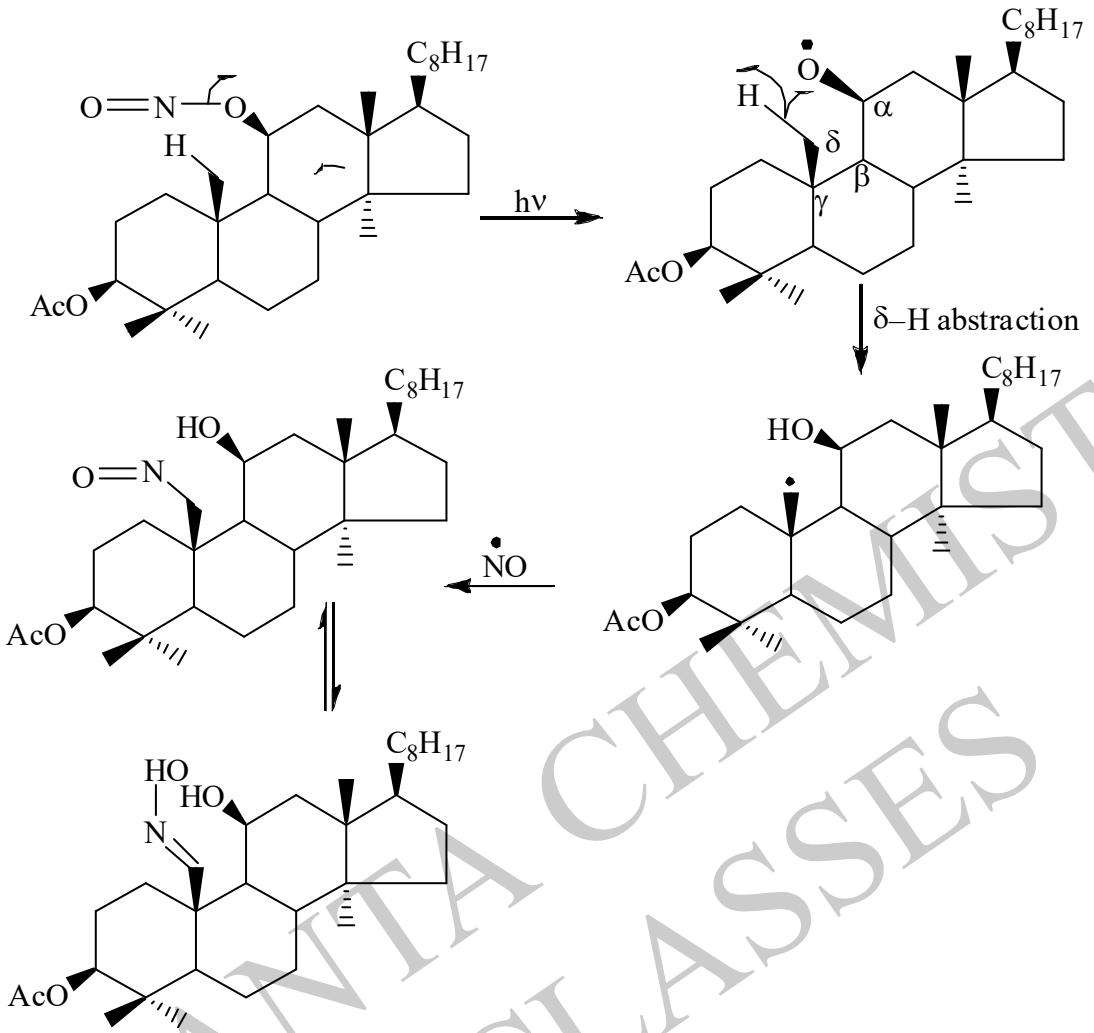


Correct option is (b)

GATE-2012

QUANTA CHEMISTRY CLASSES

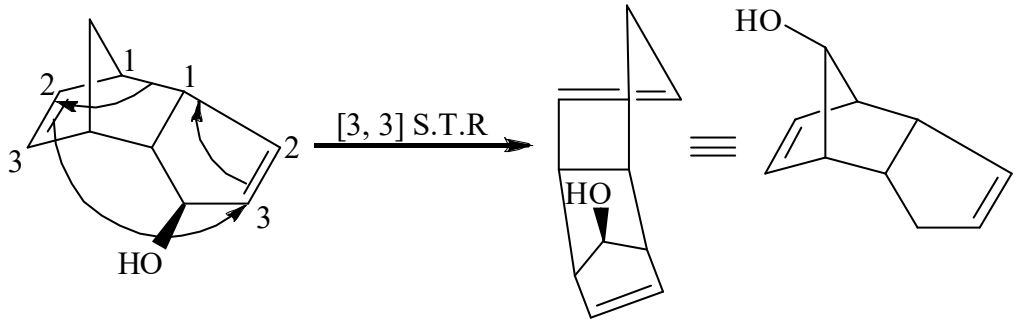
21.



Correct option is (a)

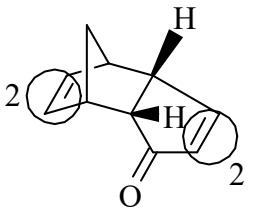
GATE-2013

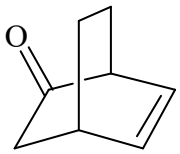
22. It is an example of 3, 3-sigmatropic shift.

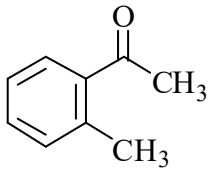


Correct option is (d

QUANTA CHEMISTRY CLASSES

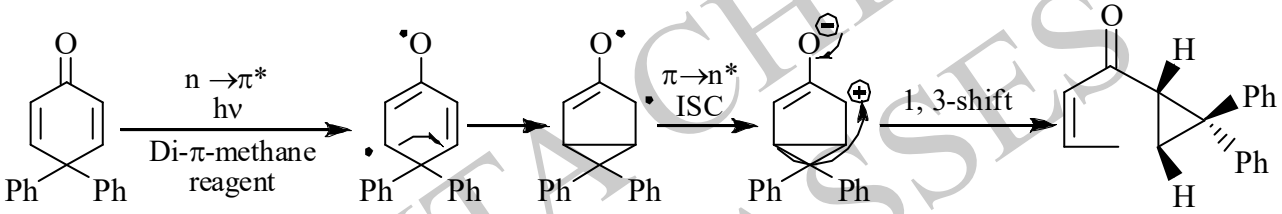
23. (i)  Intramolecular [2+2] cycloaddition reaction

(ii)  Oxa-di-π-methane rearrangement

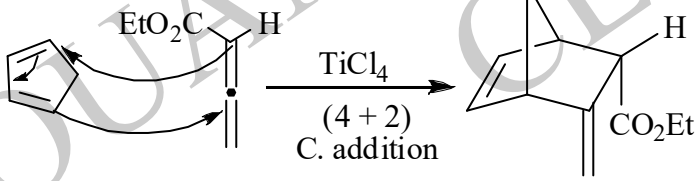
(iii)  Photoenolization

Correct option is (b)

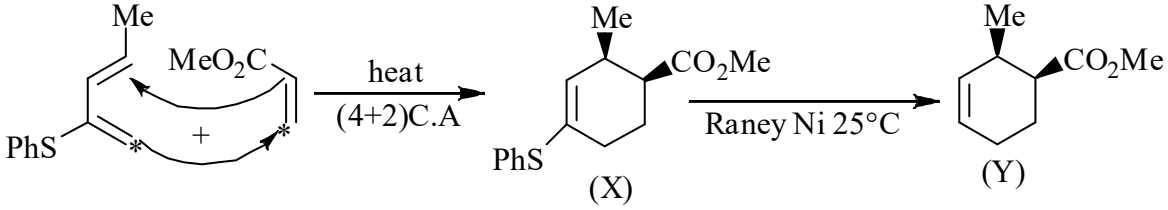
GATE-2014

24. 

Correct option is (a)

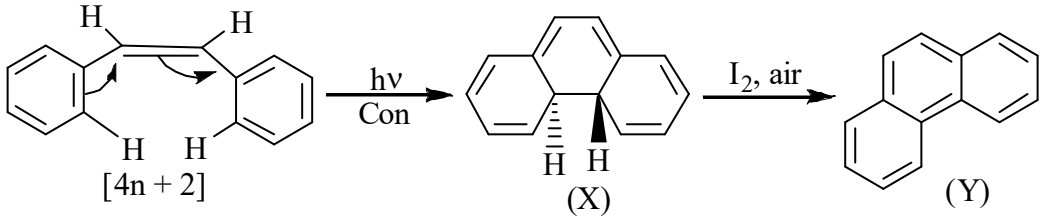
25. 

Correct option is (c)

26. 

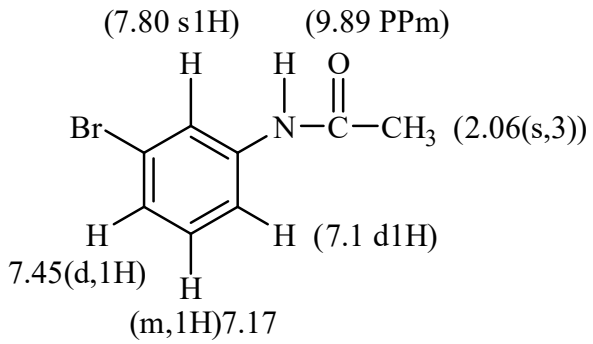
Correct option is (a)

QUANTA CHEMISTRY CLASSES

27. 

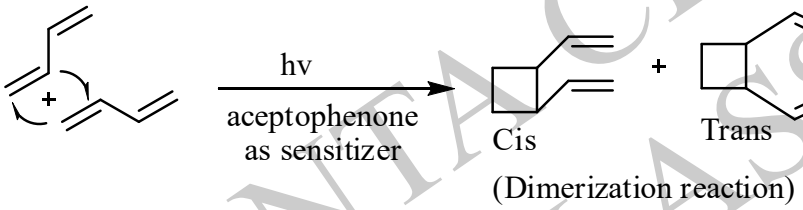
Correct option is (a)

GATE-2015

28. 

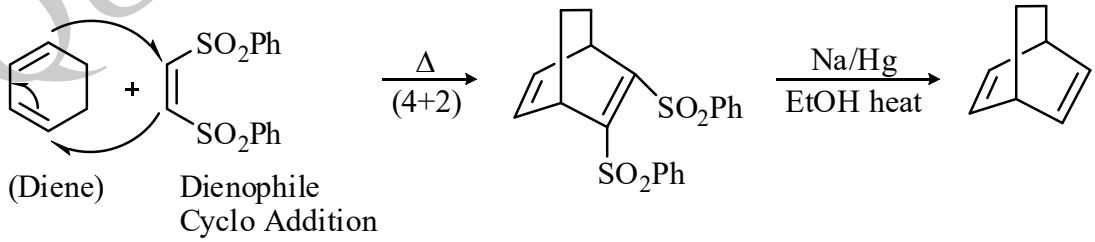
Correct option is (a)

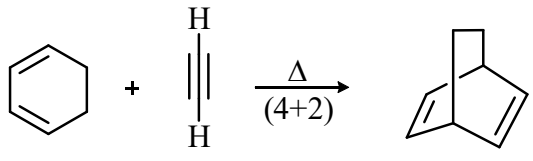
GATE-2016

29. 

Correct option is (d)

GATE-2017

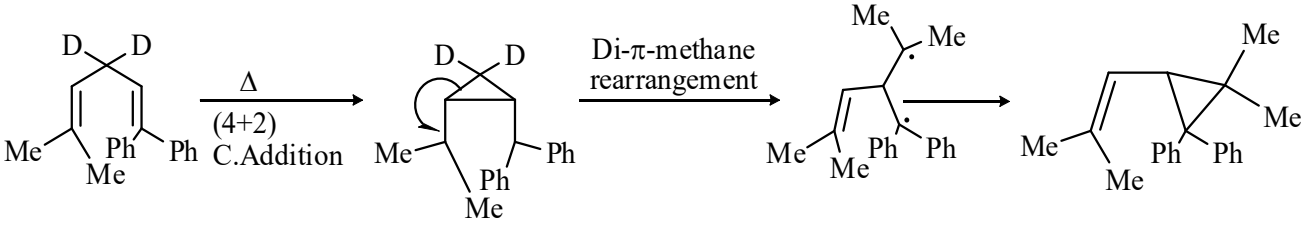


30. 

Correct option is (a)

QUANTA CHEMISTRY CLASSES

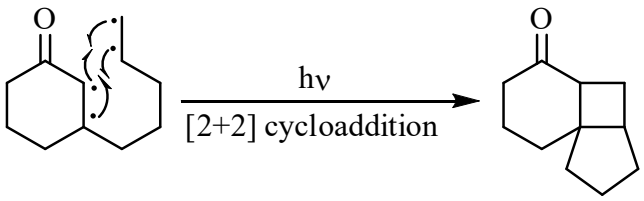
31.



Correct option is (d)

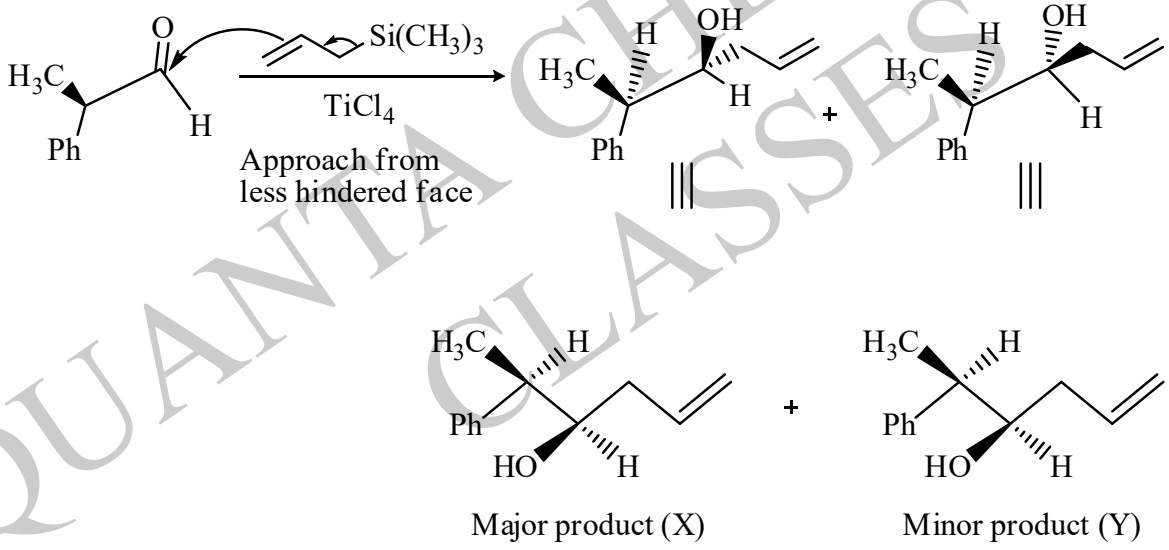
GATE-2018

32.



Correct option is (d)

33. Cram's Product :

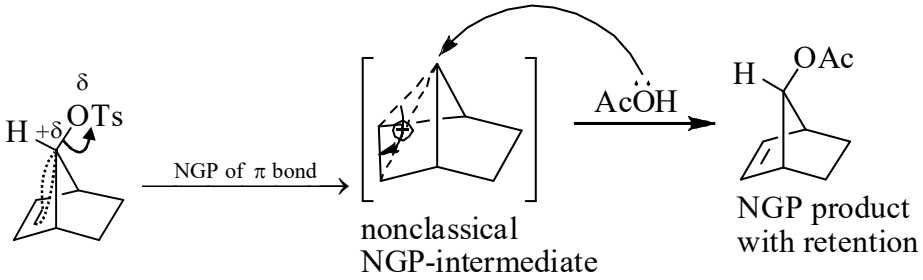


Major product (X) Minor product (Y)

Correct option is (a)

GATE-2019

34 Sol.



nonclassical NGP-intermediate

NGP product with retention

QUANTA CHEMISTRY CLASSES

35Sol. $\nu_{\infty} = 400\ \text{MHz}$

$$\delta(\text{ppm}) = \frac{1560\ \text{Hz}}{400\ \text{MHz}} \times 10^6$$

$$\delta = \frac{1560\ \text{Hz}}{400 \times 10^6\ \text{Hz}} \times 10^6 = 3.9\ \text{ppm}$$

QUANTA CHEMISTRY CLASSES

QUANTA CHEMISTRY CLASSES

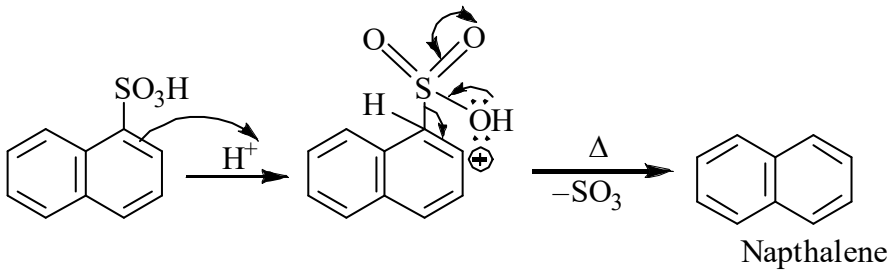
10

HETEROCYCLIC COMPOUNDS

HINTS & SOLUTION

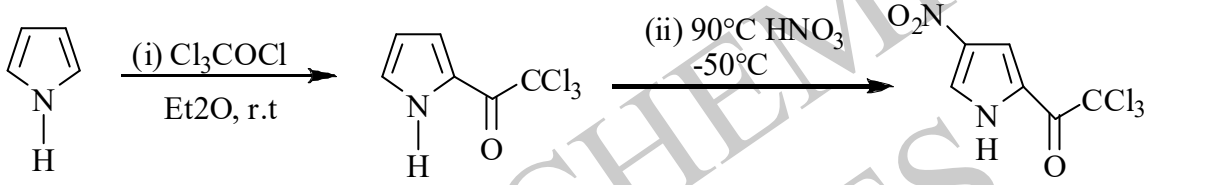
GATE-2006

1. $H_2SO_4 \longrightarrow H^+ + HSO_4^-$



Napthalene

Correct option is (a)

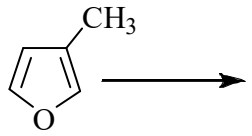
2. 

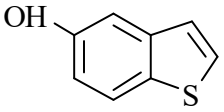
Meta-Directing

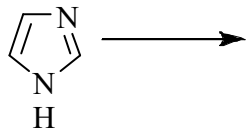
Correct option is (b)

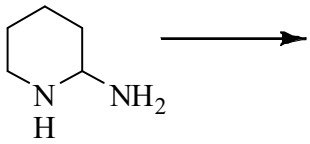
GATE-2007

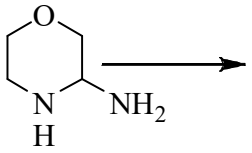
QUANTA CHEMISTRY CLASSES

3.  3- methyl furan

 5-hydroxybenzothiazole

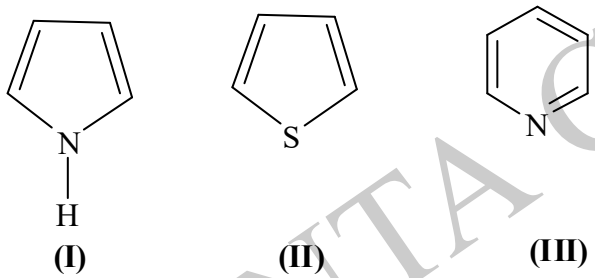
 Imidazole

 2-amino piperidine

 2-amino morpholine

Correct option is (a)

GATE-2010

4. 

(I) **(II)** **(III)**

Pyrrole is more activated bacause the electron density present on the nitrogen involves in the aromatic sextet and increases the electron density in the ring whereas thiophene have vacant d-orbital. So, it withdraw some% of electron density towards itself and also overlaping of 2p of C and 3p of 'S' atom is slightly poor than that of 2p of 'C' and 2p of 'N' of pyrrole. So, less electron density available in thiophene ring. Wheareas in case of pyridine 'N' atom reduce the electron density further reaction will be electrofile.

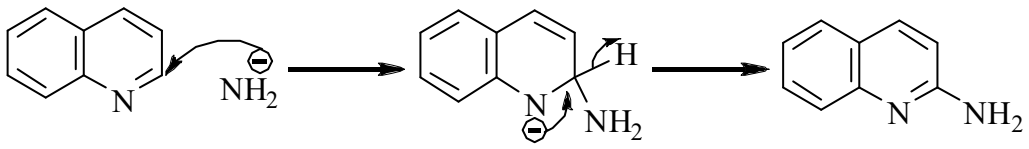
Pyrrole > Thiophene > Pyridine

Correct option is (d)

GATE-2013

5. It is an example of Ts chichibabin reaction

$KNH_2 \longrightarrow K^+ NH_2^-$

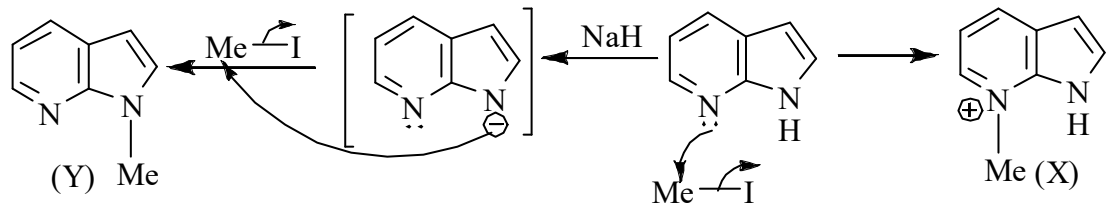


Correct option is (b)

GATE-2014

QUANTA CHEMISTRY CLASSES

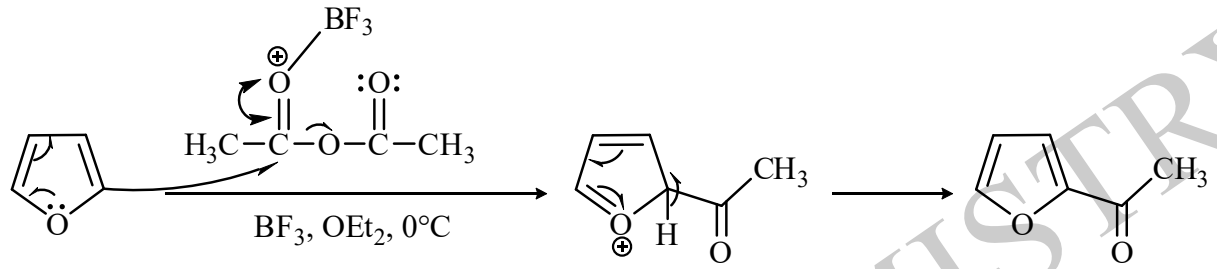
6.



Correct option is (b)

GATE-2016

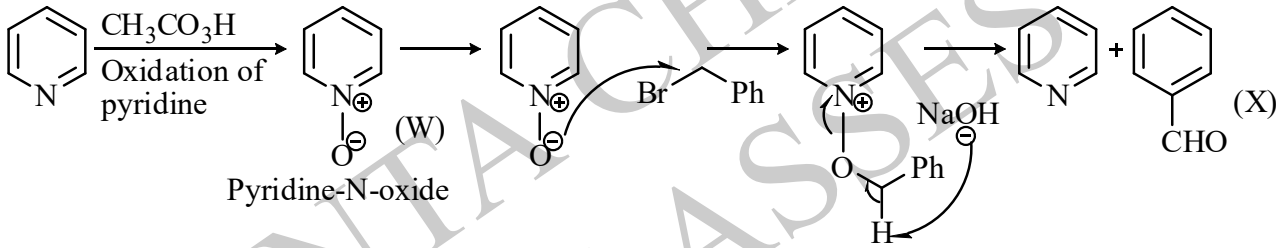
7.



Correct option is (b)

GATE-2017

8.



Correct option is (d)

QUANTA CHEMISTRY CLASSES